THE GENERA HYPERA AND PHYTONOMUS (Coleoptera, Family Curculionidæ) IN AMERICA, NORTH OF MEXICO.*

By E. G. Titus, Sc. D.

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INTRODUCTION.

The genera *Hypera* and *Phytonomus* belong to the tribe *Hyperini*, a member of the subfamily *Curculioninae* of the Coleopterous suborder Rhyncophora.

Both genera are well distributed over the northern hemisphere, being especially abundant in Europe, the last catalog of Heyden, Reitter and Weise listing in Phytonomus from "*Europae caucasi et Armeniae Rossicae*" 64 species, 3 varieties and 21 aberrations.

In America Leconte in 1876 listed 9 species, three of which are European. Since that time, we know of the introduction of two more European species. The present paper includes 13 species. One Phytonomus has been described from Mexico and in South and Central America are a number of species of *Phelypera*, a very closely related genus.

In the present paper will be treated only those species known to occur in America, north of Mexico, of the genera

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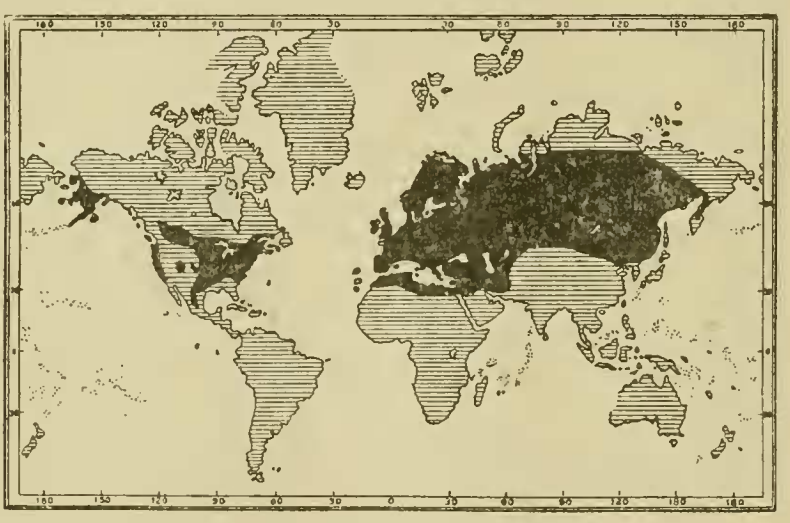
Hypera and *Phytonomus*. Specimens have been seen of all the species reported from this region, and the types of six species have been examined.

In connection with the study of the American species the author has studied 45 of the European species, in some cases including a large number of specimens. Over 500 American specimens have been examined, exclusive of several thousand specimens of *P. posticus*.

ACKNOWLEDGMENTS.

It is with pleasure that I here acknowledge the generous loans and gifts of material and the receipt of many records from the various sources here given.



Map 1. Distribution of Hypera and Phytonomus.

From the personal collections of C. A. Frost, Framingham, Mass.; F. A. Sherriff, Melrose Highlands, Mass.; Frederick Blanchard, Tyngsboro, Mass.; C. T. Brues, Bussey Institution, Harvard University; Charles Schaeffer, Brooklyn, N. Y.; R. P. Dow, New York, N. Y.; E. A. Bischoff, Irvington, N. J.; Henry Wenzel, Philadelphia, Pa.; W. S. Blatchley, Indianapolis, Ind.; J. D. Evans, Trenton, Ont.; A. B. Wolcott, Chicago, Ill.; Prof. H. F. Wickham, Iowa City, Ia.; R. L. Webster, Ames, Iowa; Warren Knaus, McPherson, Kan.; Franklin Sherman, Jr., Raleigh, N. C.; Norman Criddle, Aweme, Man.; Trevor

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Determined European material of *Phytonomus murinus*, *P. variabilis* and *P. viciae*, has been received from Dr. Edmund Reitter of Paskau, and Prof. Victor Ferrant of Luxemburg, and numerous specimens representing a number of European species from Baron von Rothkirch, Lubben, Germany.

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To my associates in Utah, and especially to Dr. E. D. Ball, Director of the Experiment Station, for having made possible the opportunity to study the life history, and to my assistant, Mr. V. A. Sadler, for his efficient aid in the field work on *Phytonomus posticus*.

Finally, I am greatly indebted to Dr. W. M. Wheeler, of Bussey Institution, Harvard University, under whom much of the systematic work has been developed, for his sincere kindness, his encouragement and advice.

HISTORY.

In 1817 Germar in Germar & Zincker's magazine published a short article calling attention to the fact that he had for a long time been studying the genus Curculio, and that he had found good characters in the large complex of species upon which to erect new genera. At that time he published the names of these proposed genera, each with one or more included species, promising later to give the descriptions.

In 1821, in the same magazine, he published descriptions of several of the genera noted in 1817. Among these was the genus *Hypera*, which he divided into two groups, containing altogether 14 species. In the former paper he gives no characters whatsoever to distinguish the different groups, merely mentioning some of the work he had done and giving the list. The genus dates from this latter paper (1821).

In 1826 Curtis in his illustration of British Insects figured on plate 116, dated May 1, 1826, *Hypera fasciculata*, and stated in the appended description that the type of the genus Hypera was *Curculio punctatus*. He included in his list a number of other species which he had examined. *H. punctatus* was one of the species included by Germar in the original description of the genus and hence will stand as the type.

In the same year (1826) Schönherr published his work "*Curculionidum dispositio methodica*," in which in pt. iv, p. 175, he erects the genus *Phytonomus*, dividing it into two groups, nearly identical with those of Hypera given by Germar. He makes the type of the genus and of his first group *Hypera polygoni* L. *Hyp. punctata* was included in his second group. He gave with each group a number of species which he considered as belonging to that complex. He undoubtedly intended to make Hypera a complete synonym, but since the type of Hypera had already been fixed, both genera should stand. At later dates both Gyllenhal and Germar accepted the genus Phytonomus as including *all* the species under the two groups, upon what grounds it is impossible to state. Giebel cites the species in the collection at "Univ. Halle-Wittenberg" under

the name of Hypera. It is apparent that these include Germar's material and would indicate that he had not changed the name in his own collection.

Why later writers (Jekel, Lacordaire and especially Fowler) should attempt to fix other types for the genus Hypera I do not know, unless I have overlooked papers to which they had access. There is no clue to such literature in their articles.

Capiomont in 1867–8 in his "Revision des Hyperides," accepts this group as outlined by Lacordaire in the Genera des Coleopteres, tome vi, p. 395. Capiomont creates several new genera in the group and separates Phytonomus from Hypera, but not on the lines given by Curtis. The paper is, however, very valuable, as being the first thorough treatment of the group after Schönherr.

Kirsch and Kraatz, each publishing in 1871, contribute nothing new to the separation of the groups included, neither does Seidlitz in his Fauna Transylvanica in 1891.

Petri in 1901 in his admirable monograph of the tribe *Hyperini* closely followed Capiomont's work. He also gives a very good list of the synonomy of the species.

The larger European catalogues before 1901 usually treated the genus Hypera with Phytonomus as a synonym or a subgenus. Weise in the Heyden, Reitter and Weise Catalog of 1906 has followed Petri except in the synonomy of the species, where he recognizes "aberrations" for most of those forms previously called varieties. This is certainly a step in the right direction, since in the species I have studied these so-called aberrations appear to be nothing more than forms due to one of several causes and likely to appear in any generation of the species. The term evidently should cover all such cases as immature specimens, color changes due to temperature or food conditions, size forms, and specimens which have lost all or part of their pubescence, especially the scales. Most of these should never have been described, as is evident from the efforts of both Capiomont and Petri to separate such forms from the typical species as *they* conceived it.

The literature of the group is of considerable size as may be judged from the bibliography of the species here treated. Without doubt references have been omitted that should have been given, but I trust that no serious omissions occur. The effect of this large number of references has been to make the

synonomy of the species very difficult. It is apparent that the name of *Phytonomus meles* is in doubt, but I do not care to change it without knowing more regarding the species *trivialis* Herbst and *roeseli* Gmelin, both of which were described previous to Fabricius' description of *meles*. The species *major* Herbst which had been assigned here as a synonym is according to Schönherr a Cleonus. Schönherr in his monumental work on the Curculionids in 1834 and 1842 gives no further aid on this synonomy.

Regarding the Stephens species the papers of Walton have been followed even where they differ from later authors since it is believed that they more nearly represent the true synonomy. Walton was in correspondence with Germar and Gyllenhal and with other continental European entomologists, and exchanged specimens with them. Where there was a further question, the papers of Capiomont and Petri have been followed if possible.

I have not attempted to place the American forms in the subgenera given by Capiomont believing that these need so much revision as to names and species included that it is well to let them alone. A more thorough study of the life-history of the various Eurasian species will without doubt introduce more synonomy if the other species of that region are as variable as those introduced into America.

The most constant characters are the scale structure, form and shape of thorax, shape and size of beak, and the genitalia. Petri has well pointed out the extreme differences in the stem of the male genitalia, the "forceps" of Petri.

All the species described from America north of Mexico have been identified, and I feel compelled to make one of the Leconte species, *Phy. setigerus*, a synonym of *trivittatus* of Say, this latter not having been previously recognized since Say's description. One new species, *Phy. maritimus* is described. *Hypera ocellata*, 1902: (Biol. Cent. Am. Coleop. v. 4, pt. 4, p. 3) was described from "Omilteme, Guerrero, 8,000 feet, Mexico (H. H. Smith)." From the description and figure, it apparently belongs near *Phytonomus eximius*.

The term *Phytonomini* of Leconte must give way to *Hyperini*, the genus *Hypera* being erected prior to *Phytonomus*.

CHARACTERS OF THE TRIBE HYPERINI.

1863: Lacordaire; Gen. des Coleopteres, tome vi, p. 395 (Hyperides).
1867: Capiomont: Revision de la Hyperides (Ann. Soc. Ent. Fr. pp. 417-560, pl. 11-12).
1868: Capiomont: Rev. de la Hyperides (con.) (Ann. Soc. Ent. Fr. pp. 74-284, pl. 1-4).
1871: Kirsch: Zur Kenntnis der deutschen Hyperiden (Berl. Entom. Zeits., pp. 173-191).
1901: Petri: Monogr. des Coleop.—Tribus Hyperini, pp. 210, figs. 58, pl. 3, also as: Bestim.—Tab. Coleop. Hft. 44, pp. 1-42.

In this group the *body* is more or less oval, the *thorax* never exceptionally long, the beak never extremely long and slender; thorax and elytra more or less covered with scales and with hairs that may be simple, emarginate or thickened.

The *head* is small and round, with the beak or rostrum well developed, often with a carina or keel on the upper surface; *antennae* set in a groove on the side of the beak, the groove usually slopes downward toward the lower side of the eyes; *antennae* (Pl. XXIV, fig. 17), composed of twelve joints, a long *scape*, seven *funicle* joints, the first two of which are longer than any of the others, and a four-jointed *club*, the antennae rarely reach to the middle of the prothorax; *eyes* oval, round or elongate-oval, often narrowed below, rather large and close together in front; *mouthparts* at the apex of the beak as usual, *labrum* wanting, *mandibles*, (Pl. XXIV, fig. 3, 4, 15), often with fine punctures, broad, stout, more or less pincer-shaped, with teeth, *maxilla* (Pl. XXIV, fig. 1, 16) broad, with short, conical four-jointed palpi which are rigid and taper more or less to a point; *lacinia* provided with stout teeth and rather long hairs, apparently always with short spines on the inner surface; *submentum* nearly rectangular, emarginate; *mentum* short and broad, *labial palpi* (Pl. XXIV, fig. 2) three-jointed, rigid, conical.

Prothorax more or less rounded above as seen from the side, sides usually somewhat swollen, anterior and posterior margins rarely as wide as the middle; oval, transverse-oval or elongate; always with a short process below between the front coxae.

Scutellum always minute.

Elytra differing greatly in form, sometimes at least three times as long as the thorax, in other species less than twice as long, elongate; oval, broad or obovate; from the side usually rather flat at the base, often rising for a short distance, and then may be abruptly declivous or rounded to the apex; 10 striae and 11 interspaces including the sutural and side spaces.

Venter as in other Curculionidae, front coxae almost contiguous, middle coxae separated by the more or less elevated process of the mesosternum and the shorter process of the metasternum; hind coxae usually rather widely separated, the intercoxal process of the third abdominal (first visible) segment being broad, but in all species examined ends in a point which is sometimes concealed beneath the metasternum; side pieces of the mesosternum diagonally divided; side pieces of the metasternum dilated in front usually rather narrowly, the outer angle causing a sinuousity in the edge of the elytron; ventral abdominal segments unequal, first and second concealed as usual, the fifth and sixth shortest, usually the seventh or fourth next, the third longest, or in some the seventh the longest; sutures straight or nearly so.

Last dorsal abdominal segment in the male with an extra piece, which appears as another segment and is (in the species examined) covered with peculiar many branched hairs or scales, pygidium not exposed.

Legs clothed with hairs or scales, usually the femora and coxae with scales only, sometimes these only in front; the apex of each of the tibia possesses a ring or crown of spines of varying length; articular surface of the hind tibiae distinctly terminal, sometimes with a projection on the inner side; tarsi dilated, third joint strongly bilobed, elongate, with a setose pad beneath; claws long, simple, free.

The description of the stages relate only to the following species: *Hypera punctata*, *Phytonomus posticus*, *P. nigrirostris*, *P. meles*, and *P. comptus*. The characters seem however, to be common to the species named, where the stages are known.

Egg: (not known in *comptus*): more or less oval, white, yellow or some shade of yellow, reticulated with hexagonal depressions.

Larva: In the younger stages (not known in *comptus*) slender, widest in the middle, head dark, dorsal surface set with dark or black tubercles upon which are inserted hairs, which are usually clavate at the tips, except on the anal segments where they are longer and simple; beneath the thorax the surface is projected into lobes, sometimes each lobe of each of the three pairs is bilobed and set with bristles; abdominal segments beneath with smaller lobes; sides with two swollen areas on each segment, the one on which the spiracles are placed

has one or more tubercles set with hairs, anal segment of three lobes, two side and one dorsal; a dorsal abdominal median paler line is present, this may extend onto the thorax.

Later stages: Head dark, glabrous with very fine transverse lines, antennae minute, two-jointed, situated near the anterior border; labrum emarginate, with a row of hairs near the edge; mandibles stout, toothed, usually dark; two small ocelli on each side of the head with a long hair between them; palpi two-jointed, a long hair or spine below the first joint. Segments of the body dorsally of two distinct parts, (Pl. XXIV, figs. 23–32), the smaller anterior part always with one pair of tubercles, a tubercle each side of the dorsal line; the posterior part larger, broader and extending almost to the spiracles, containing on the dorsum, at least, one row of tubercles, some of the thoracic and last abdominal segments may have more rows; spiracles black, nine in number situated a little above the middle and well forward on the side of the segments which possess them, below them one or two tubercles, the spiracles and these tubercles are on the first set of swellings or enlargements; the enlargement below the first is usually small, the third is on the venter and contains the leg-like tubercles.

Cocoon: All the species noted above spin reticulate cocoons, usually oval or globular, varying considerably in the size and shape of the openings.

Pupa: Rather short and wide, all the appendages very evident, wing-pads rather long, thorax broad, the abdominal segments with transverse rows of setae; the thorax with hairs, those on the prothorax regularly twenty in number, a row of five pairs curving around the anterior margin on each side, the fifth of which is sometimes set far back; and a curved row of five pairs beginning near the center and passing backward to the posterior outer angle. The arrangement of these hairs appears to be constant in each species examined (pupa of *meles* not seen).

Life-history: *Eggs* laid, except with *Hyp. punctata*, in the spring on the food plants or inserted into some part of the plant, such as leaf, leaf-sheath, petiole, stem, flower-heads or buds. The habit of *comptus* is not known, but from the time the larvae appear it is probable the eggs are laid in the spring, the same holds for *P. eximius*.

Larvae upon hatching, generally remain concealed for some time feeding in a protected place, usually not feeding in the open except at night or when very numerous, when they pass out onto the leaves even in broad daylight. Some feed in flower-heads (*meles* and *nigrirostris*, prob. also *eximius* and *comptus*); others in the leaf-buds (*posticus*), but all when numerous will defoliate their food plant.

The larva when full grown spins a cocoon that may be placed among the flowerets (*nigrirostris*), on the upper surface of the leaves (*comptus*); on or near the ground, in leaves or other debris (*posticus*) or in the ground (*H. punctata*). Even in the same species there is some diversity of habit.

In those species where the cocoon spinning has been watched the process is as follows (Folsom, Titus for *Hyp. punctata*, Titus, Ainslie, Sadler for *P. posticus*, Titus for *P. nigrirostris*).

In *Hypera punctata* the larva buries itself in a small oval cell in the ground, slightly under the surface; this cell it smooths with its head and by turning around and around with its body in the characteristic curved position; the other species do not form cocoons in the ground. The spinning in the species observed is done with the mouth. The first hairs are placed as a round network on the surface where the larva is lying, then lying on its back it reaches with the head to one side slowly spinning the thread upward. The thread hardens and is thus sometimes carried over to the other side making a framework upon which to attach other threads. More often the threads are laid down along the first network and gradually built up on each side, the larva often puts its mouth or parts of its mouth through the coarser network and fastens a thread outside. The meshes are gradually reduced in size by placing other threads in both directions inside the first rows, this is especially true with *comptus* and *punctata*.

Every few seconds, or at least every half minute the larva reaches back to the anus and apparently from some gland secures a fresh supply of silk, the operation of securing this silk can be better described as sucking than "nibbling" though it partakes of the character of both. It may be that this is a secretion from the malphigian glands as found by Silvestri to occur in *Lebia*. Pupation occurs from one to three days after the cocoon is completed.

When the adult beetle appears it rests in the cocoon until the wing-covers are somewhat hardened and then eats its way out. From the descriptions given apparently some species devour the entire cocoon, this has been noticed but rarely with *posticus* and has not been reported for *punctata*.

The beetles usually feed by night and rest concealed in the daytime beneath rubbish or leaves or even in cracks in the ground. The smaller specimens often lie in the leaves or opening leaf-buds. The beetles cause considerable injury by their feeding habits at this time, gnawing the parenchyma from the stems and feeding upon the leaves.

The introduced European species, and probably all the species, hibernate as adults.

The group has in common with some other Curculionidae the habit of distributing themselves by flying at some stated period, in Phytonomus it appears at least in three species (*nigrirostris*, *posticus*, *meles*) to be in the spring. *P. posticus* has two flights, the second occurring in the summer, *Hypera punctata* has at least late summer or fall flight.

Food-plants: Kleine has published (1910) the food plants of the European species of Phytonomus so far as known. They include plants in many different groups, but especially among the legumes (Fabaceae) and buckwheat (Polygonaceae) families.

The native American species whose food-plants are known are *comptus* on *Polygonum; eximus* and *quadricollis* on *Rumex; trivittatus* (setigerus Lec.) on *Lathyrus*, and *maritimus* on "Vicia."

The introduced species are primarily leguminous feeders, attacking especially clovers and alfalfa; probably they will feed upon any species of *Trifolium*, *Medicago* or *Melilotus*. They will also attack the Astragalus group and the vetches. *Hyp. punctata* will live upon beans in both larval and adult stages. Other food-plants reported for them, such as golden-rod, potatoes, timothy, wheat and cabbage, are doubtless more or less accidental.

Along the Atlantic Coast the introduced species are but occasionally noticed as injurious to the crops, but as they move westward across the Alleghany Mountains, their injuries increase. It is probable that when *Hypera punctata* from the East and *Phytonomus posticus* from the West meet on the western plains, we will hear much more regarding their injurious feeding habits. It is certain that the alfalfa weevil (*P. posticus*)

is a most serious pest in the parts of Utah where it is at present common and doubtless will be so in any of the western alfalfa regions. Railroads lead in all directions and it is only a matter of time until this species has reached the other alfalfa growing localities. (Map 11.)

In the dry regions. where there is little rainfall during the hot summers and very little humidity in the atmosphere, it is very doubtful if the fungus diseases will work. In the coast regions the fungus is undoubtedly the one enemy that keeps the species there present in check.

Cultural methods, the introduction of better methods of farming, rotation of crops, use of gathering machines, careful stamping out of incipient colonies and the hope of parasites from Europe are all factors leading toward the control of the species of this group in the more arid climates.

Plates XXXIII and XXXIV illustrate something of the problem from the standpoint of the western farmer and show what is being done to aid in cultural lines. Plate XXXIII is adapted from Bul. 110 of the Utah Agr. Exp. Sta., which gives an account of the work accomplished against *P. posticus* up to July 1, 1910.

GENERA HYPERA AND PHYTONOMUS.

While these two genera are closely related, there are unmistakable characters that readily separate them. *Hypera* has the beak short, blunt and thick; scarcely one-half longer than the remainder of the head; mandibles never emarginate; elytra much wider than the thorax; usually wider or as wide as the distance from base to point where the elytra curve downward; humeri very prominent, convex; alternate interspaces beginning with the sutural one strongly elevated and wider than the others; intercoxal process broad, stem of male genitalia (Pl. XXIV, fig. 14), fully as wide as long.

Type: *Hypera punctata* Fab.

In *Phytonomus* the body is never stout, broad and thick, beak never short and blunt; intercoxal process somewhat narrowed at tip; mandibles always more or less emarginate; elytra as wide or a little wider than the thorax; stem of male genitalia (Pl. XXIV, figs. 5–13), much longer than wide, generally two or three times longer.

Type: *Phytonomus arator* L. (polygoni L.)

Hypera lays eggs in the fall, some larvae hatch then, others the next spring. Cocoon may be formed in the ground, and the meshes are very much closer than in any Phytonomus cocoon known.

Phytonomus lays eggs in the spring (so far as known); the cocoon apparently never formed beneath the surface of the earth.

TABLE OF SPECIES.

Beak stout, never longer than prothorax.

Large robust species, beak shorter than prothorax; hairs of prothorax and elytra long and slender; scales striate, narrowed toward tip, emarginate without processes, concave, rounded at base.....**Hypera punctata**

Elongate, rather stout, sides of elytra almost parallel, thorax longer than broad, beak scarcely as long as prothorax; setae on prothorax thick, numerous, scales sparse, parallel-sided, deeply emarginate.
Phytonomus diversipunctatus

Beak more slender, always longer than prothorax.

Front between the eyes narrower than eye at widest part..... 1

Front between the eyes always distinctly wider than eye at widest part, usually slightly concave..... 8

1. Scales not at all cleft or emarginate.....2
   Scales more or less emarginate.....4
   Scales cleft.....5
2. Body not elongate, flattened, sides of elytra never parallel; scales truncate, concave, widest at middle, striate.....**Phytonomus eximius**
   Body elongate, flattened, sides of elytra parallel..... 3
3. Thorax deeply punctured, polished; scales concave, truncate, widened at tip, finely striate; setae thickened at tip, more numerous on posterior part of elytra.....**Phytonomus quadricollis**
   Thorax not polished, punctures shallow, indistinct, glabrous, more or less confluent; scales parallel-sided or narrowed at tip, thick, indistinctly striate, no hairs on dorsum.....**Phytonomus comptus**
4. Scales finely striate, deeply emarginate, sides curved; hairs thick at base and near tip abruptly narrowed to a point; prothorax as wide as long; punctures of elytral striae with minute setae.**Phytonomus trivittatus**
   Scales deeply emarginate; hairs on prothorax thick, sides parallel, tip notched; prothorax longer than wide, setae in elytral striae short, thick and white.....**Phytonomus maritimus**
   Scales deeply emarginate, processes and elytral scales as long as body of scale; beak scarcely longer than prothorax, species small, stout.
   Phytonomus pubicollis
5. Scales cleft nearly or quite to base.....6
   Scales not nearly cleft to base.....7
6. Prothorax much wider than long, sides prominently rounded.
   Phytonomus meles
   Prothorax not wider than long, species rather narrow, elongate; hairs on dorsum long, fine, pointed.....**Phytonomus nigrirostris**
7. Prothorax almost as wide as long; hairs on dorsum, especially on posterior part of elytra, semi-decumbent, long and pointed..**Phytonomus posticus**
8. Scales of elytra cleft to or almost to base; prothorax with numerous emarginate hairs mixed with sparse cleft scales, front distinctly concave, beak much longer than prothorax.....**Phytonomus seriatus**
   Scales of thorax and elytra all deeply cleft, some scales on head are cleft; prothorax with sparse, thickened, blunt hairs, beak scarcely longer than prothorax.....**Phytonomus castor**

Hypera ocellata—described 1902: Biol. Cent. Amer. Coleoptera, v. 4, pt. 4, p. 3, would appear from the figure and description to be related to *Phy. eximius*, except that the beak is described as short and widened at the tip. The species has eleven black elytral spots and ochreous and gray scales. The two specimens were collected at "Omilterre, Guerrero, 8,000 feet (H. H. Smith) Mex."

The following names are undoubtedly *nomina nuda* but if opportunity offers someone should examine the specimens provided they are still in existence and correctly determine them.

1837: Dejean: Cat. Coleop. Coll. Dejean. p. 286. *Phytonomus confusus*—Amer. boreal.

1869: Giebel: Col. Univ. Halle Wittenberg, p. 44, No. 28, "*Hypera nudirostris* Germar in litt., Nord Amer." No. 31 an unknown species from "Nord Amer."

Hypera punctata Fabricius.

——— ———:
1762: Geoffroy: Ins. 1: 279. "Curculio no. 5."
1779: Schaeffer: Icones Insectorum, tab. 25, fig. 6.

Curculio punctatus:
1775: Fabricius: Systema Entom., p. 150, no. 119.
1781: Fabricius: Species Insectorum, 1: 190, no. 166.
1781: Laichart: Verz. u. Besch. d. Tyrol Ins. Kafer, 1 (pt 1): 16, no. 221
1787: Fabricius: Mantissa Ins., 1: 117, no. 221.
1787: Schneider: Neus Mag. Entom. 3(pt 2): 116, no. 190.
1788: Zschachii: Pars Entom. p. 21, no. 458.
1789: Villers: Entom. Fauna Suec., 1:213, no. 169; 4: 279, no. 169.
1790: Gmelin: Linn. Syst. Nat., ed. xiii, p. 1786, no. 378.
1790: Olivier: Hist. Nat. Ins., 5: 541, no. 315.
1790: Rossi: Fauna Etrusca, 1: 131, no. 335.
1792: Fabricius: Entom. Syst. emend. 1(pt 2): 472, no. 329.
1792: Paykull: Monog. Curc. Suec., p. 111, no. cvii.
1795: Fabricius: Nomen. Entom., p. U.
1795: Herbst: Nat. Ins. Kafer, 6:505, no. 540.
1795: Panzer: Entom. Germaniea, p. 329, no. 174.
1795: Rossi: Fauna Etrusca, (Hellwig ed.) 1: 139, no. 335.
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1890: Smith: Cat. Ins. New Jersey, p. 250.
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Brachyrhinus austriacus:
1804: Latreille: Hist. Nat. Gen. et parc., 11: 179, no. 89.

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Hypera punctata var. *austriaca:*
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Phytonomus punctatus var. *austriacus:*
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Curculio pictus:
1785: Foureroy: Entom. Paris., 1: 117, no. 5.
1789: Villers: Entom., Fauna Suec., 1: 216, no. 187; 4: 282, no. 187.

Hypera punctata var. *picta.*
1871: Gemminger & Harold: Cat. Coleop., 8: 2386.

Curculio linzensis:
1790: Gmelin: Linn. Syst. Nat. ed. xiii, p. 1799, no. 477.

Hypera punctata var. *linzensis:*
1871: Gemminger & Harold: Cat. Coleop., 8: 2386.

Phytonomus punctata var. *linzensis:*
1901: Petri: Monogr. Coleop. Trib. Hyperini, p. 202.
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Curculio medius:
1802: Marsham: Entom. Brit., 1: 302, no. 185.

Phytonomus proximus:
1833: Carmagnola: in Villa Cat. Col. Eur. dupl., p. 24.
1843: Sturm: Cat. Coleop. Sammlung, p. 201.

Hypera punctata var. *proxima:*
1871: Gemminger & Harold: Cat. Coleop., 8: 2386.

Phytonomus rufus:
1834: Boheman in Schönherr: Gen. et sp. Curc., 2 (pt 2): 402.
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Hypera punctata var. *rufa:*
1871: Gemminger & Harold: Cat. Coleop., 8: 2386.
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1883: Weise in H. R. & W. Cat. Coleop. Eur., ed. 4, p. 159.
1891: Weise in H. R. & W.: Cat. Coleop. Eur., p. 303.

Phytonomus punctatus var. *rufus:*
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Phytonomus punctatus var. *hostilis:*
1837: Dejean: Cat. Coleop. Coll. Dejean, ed. 3, p. 287 (credited–Ziegler).
1901: Petri: Monogr. Coleop. Trib. Hyperini, p. 202.
1901: Petri: Bestim.—Tab. Coleop. Hft. 44, Hyperini, p. 39 (hortilis).

Hypera punctata var. *hostilis:*
1871: Gemminger & Harold: Cat. Coleop., 8: 2386.

Phytonomus opimus:
1876: Leconte: Rhyneophora of North America, p. 124, 415.
1884: Reineeke: Buffalo Freie Press, 12 Aug.
1884: Reineeke: Bul. Br'klyn. Ent. Soc., 7: 76.
1882: Leeonte: Trans. Am. Ent. Soe. 9: proe. p. xxxvi.

Hypera opimus:
1880: Austin: Supp. Check List Coleop. N. Am., p. 45, no. 8881.

Phytonomus fallaciosus:
1896: Desbroehers: Frelon, 5: 67.

Original Description: Fabricius, 1775, p. 150, as *Curculio punctatus.*

"*punctatus.* 119. *C. brevirostris, fuscus, elytris punctis, holosericeis elevatis; marginecue flavo.*

"Habitat in Suecia.

"*Major, ovata, Rostrum brevissimum. Thorax gibbus, glaber. Elytra striato punctata, et praeterea punctis elevatis, holosericeis atris adspersa.*"

Adult: (Plate XXV). Length 5 to 10 mm. Width 3 to 5.7 mm.

Stout, black or brownish black. Clothed with blackish brown pale brown, yellow-brown or gray scales which are short broad and emarginate at the tips, and with short erect bristles, edge of elytra yellow brown or at least paler than remainder of scales.

Head clothed with short metallic yellowish scales; *front* not as wide as breadth of eye, densely clothed with dark yellow hairs or scales which extend over two-thirds of the beak. *eyes* elongate oval, narrowed beneath, rather prominent; *beak* scarcely two-thirds the length of the prothorax, and one-half thicker at tip than width of front, beneath on the sides and near the tip polished and densely punctate; an elongate impression on dorsal surface above the antennal groove; *antennal groove* black, deep, punctured; *antennæ* reddish-black, scape reaching to middle of eyes, not as long as funicle, not greatly enlarged at tip; first joint of funicle distinctly longer than second, enlarged at the apex so that it is about one-half as thick as long, second joint equal to three and four united, joints three to seven regularly shorter and broader, seven as wide as long, club elongate-oval, pointed at tip, antennæ with many fine hairs, those on club very fine and dense. Mandibles polished, dull red, not emarginate at tip, maxillæ and all the palpi pale brownish-red.

Prothorax broader than long, broader in female than in male, in the female broadly widened in front of the middle, in the male converging more behind than in female; sides broadly impressed, only slightly swollen; dorsum densely rather coarsely punctured, densely clothed with scales and with many slender pointed hairs; usually with a narrow pale median dorsal line bordered by wide dark, almost black in some, bands of scales which reach to the sides; sides and beneath with dark yellow scales, generally with a dark spot on sides behind and an indistinct dark line running from this spot toward the front.

Scutellum extremely small, narrowly triangular, clothed with pale scales.

Elytra very broad, at tip broadly rounded, sides especially in the male nearly parallel, humeri prominent and clothed with darker scales. Suture and alternate interspaces more strongly elevated than others, deeply striately punctured, striae without setae; each interspace with a single row of black setae pointing backward and partially decumbent, more erect behind; tip of elytra and often the sides with some short white hairs. The coloration of the scales varies from solid gray to black, through various shades of brown yellows. Some specimens are tesselated with brownish-yellow and black, the tesselation usually on the more elevated interspaces.

In the male the outer interspaces have paler scales even in the darkest specimens, in the female this pale coloration is sometimes, but rarely, entirely absent.

Venter with lighter colored scales and many light hairs; front coxæ slightly separated, mesosternal process between middle coxæ broad perpendicular, triangular at tip; intercoxal process of first abdominal segment very broad, coxæ separated by more than their width. First segment in male impressed, emarginate posteriorly. Stem of male genitalia (Pl. XXIV, fig. 14), nearly or quite as broad as long.

Legs short, stout, especially the femora; black, tarsi often ferruginous, claws long curved, red and darker at tips; front tibiæ and hind femora distinctly curved, front tibiæ more so in male; legs usually clothed with lighter scales and hairs than the body, femora scaled, tibiæ and tarsi sparsely haired; middle tibiæ with a distinct apical hook.

Egg: elongate oval, 1.1 mm. to 1.2 mm. long, 0.5 to 0.6 mm. broad, very regularly hexagonally sculptured. The sculpture at one end often merging into striæ. As the larva develops the egg changes from an orange or chrome yellow to a dull black.

Larvæ: (Pl. XXVI, fig. 1). (Descriptions from Riley, Folsom and observations by the author). *First stage:* 1.5 to 2 mm. long, narrow, thickest at middle, tapering toward both ends; head brown, blackish-brown or black, with many fine transverse lines on the face; eyes very small, circular, projecting; mandibles terminating in two large sharp teeth, more or less separated, the lower one again divided into two or three parts; palpi pale yellow, mandibles brown or dark brown; dorsum of first thoracic segment with a rectangular dark band interrupted by a paler dorsal line which is the continuation of the stem of an inverted Y on the face, this dorsal band becomes wider on the abdominal segments and extends to the tip of anal segment. Hairs on the tubercles clavate as in several other species. Color varies with place of feeding, if concealed in bud or stalk is very pale, if exposed is more or less green.

Second stage: Color greener, head dark brown, front and sides of rectangular plate on first thoracic segment dark, the remainder greenish; dorsal median line with a fine dark border, darker than the remainder of the larva. Side line below spiracles indistinct. Length 4–4.5 mm., width 2 mm.

Third stage: Black lines on each side of dorsal line very distinct; head as in second stage, eyes densely black, antennæ darker; color of larvæ (Folsom) may be blue green. Usual color pale green. Length 5 to 7 mm., width 2.5 to 3 mm. in the middle.

Fourth stage: Dorsal line very white indistinctly bordered by rose color, usually rather pale but sometimes rosy-black, the outer borders of this coloration are black and form distinct lines, interrupted on the margin of each segment; head very dark brown; larva much darker green; lines below the spiracles dark both showing a tendency to be brown or blackish, anal segments brown; the surface of the body much rougher in this stage than in others, the triangular points of the cuticle standing out prominently; tubercles on the thoracic segments below very strong and the hairs more prominent than in earlier stages. Length 8 to 14 mm.

Cocoon: (Plate XXVI, fig. 2). A fine network of rather coarse brown threads, not so dark as in *comptus*, but the reticulations closer than in any species studied. Oval, 9–10 mm. long and 6.5 to 7 mm. wide.

Pupa: (Plate XXVI, fig. 4, 5). When first formed with yellow-green head, small brownish-black eyes, yellow antennæ, legs and wing-pads paler. Abdomen dark green with a distinct pale dorsal line that extends onto prothorax but in those I have seen not onto the head. Frontal row of hairs rather distant from margin; central pairs close together, three following pairs form a curved line ending near the posterior outer edge; a few hairs on remainder of thorax; transverse rows of blunt setæ on each dorsal abdominal segment; hairs on beak rather short and thin; those on anal segment moderately long, stout and dark. Length 5.5–7 mm. Width 3.5–4.5 mm. Probably some are larger than these measurements show.

Map 2. Distribution of *Hypera punctata* Fab. in America.

Distribution: The species was described by Fabricius in 1775 from Sweden, and both Schaeffer and Geoffroy list it without a name. Nearly all of the earlier writers mention it and in 1826 Curtis made it the type of Germar's genus Hypera.

It is common over all Europe and northern Asia, occurs and probably also common in central Asia and in China. Asia Minor and the north coast of Africa appear to be more rarely inhabited by this species, *isabellinus* taking its place in Egypt.

It is becoming well distributed over the United States and southern Canada, occurring now on both coasts and at least as far south as Texas, Tennessee and North Carolina.

The following records are based on literature, specimens seen, and records sent me by various collectors.

The type of *opimus* is from the Melsheimer collection and is an almost perfect specimen of the pure gray form. The Canadian specimen mentioned in 1876 by Leconte was received by him from Mr. D'Urban of the Geol. Survey of Canada about 1850–55. It was not until 1881 that the species was again reported, when it occurred at Barrington, N. Y.; in 1882 Lintner took a specimen in Vermont. In 1884 *punctatus* reached Canada in numbers, flying across the lake from Buffalo to Ridgeway, 1889 it occurred in several places in Ohio, probably having reached there the previous year. Hamilton reports it from Western Pennsylvania in 1891 and Schwarz identified a beetle taken from the stomach of a crow killed in Michigan in 1892 as this species. Southward by 1890 it had spread over New Jersey and reached Philadelphia where it was very common (Liebeck). The year 1894 gave records from Maryland, Michigan, W. Virginia (Hopkins), and Indiana. C. T. Brues took it in 1897-98 along the shore of Lake Michigan at Chicago, it being one of the very common species at that time. Folsom records its first appearance at Urbana as 1903 and it was common there in 1904. In Pennsylvania, Stewart and Rathvon report it in 1891 and it apparently soon afterward reached Maryland and the District of Columbia, since in 1894 it was seriously damaging clover in western Maryland. Lintner in 1893 received specimens from a correspondent at Hillsboro, Va., where it was then troublesome. Franklin Sherman, Jr., writes me that he collected specimens in North Carolina in 1901; there are specimens in the Brues collection from Austin, Texas, 1901–2. I have specimens collected at Memphis,

Tennessee, in 1906, and took one female at N. Topeka, Kansas, 17, September, 1910. R. L. Webster reported it from Iowa in 1910. On the west coast Hanham reported it from Vancouver in 1902 (Fletcher) and in 1906 E. S. Wilmot states it that was up the Fraser River as far as Harrisons, about twenty miles from the south line of British Columbia. It was not until 1905 that it was reported from Ottawa, Ontario (Harrington). There are specimens in the Blaisdell and Van Dyke collections from San Francisco, 1908, and in the Van Dyke collection from near Seattle, Washington, 1907. G. I. and Miriam Reeves collected it at Vancouver, Wash., in 1911.

Felt (*in litt* 1911) gives a large number of New York records and says distributed commonly over the entire state. Blatchley (*in litt.* 1911) states that it is in all parts of Indiana.

Maine: Old Orchard Beach (Fall coll.); York Beach (Frost coll).

New Hampshire: Base Mt. Washington ix–19–09 (Frost).

Vermont: Hartland (U. S. N. M.).

Massachusetts: Framingham viii–4–06, vii–5–06, ix–7–07 (Frost); Bedford (Frost); Forest Hills winter and fall 1910–11 common; Salisbury, Lynn, Wakefield, Marion (Fall coll); Stoneham iv–2 (Sherriff); Brookline viii–13, Boston viii–20–02, iv–6–04 Parshley (B. S. Nat. Hist.); Nantucket Id (Bolter coll.).

Rhode Island: Providence 18–Sep–02 Armstrong (U. S. N. M.); Kingston.

Connecticut: Stratford 1891 (Ins. Life); common from records by Britton, (*in litt*, 1911), which include the following: New Haven, 9 Nov., 1903, pair in coitu, H. L. Viereck; 16 Oct., 1903, 18 Aug., 1903, B. H. W.; 16 Aug., 1904, B. H. W.; 9 July, 1909, B. H. W., 12 Sep., 1907, W. E. Britton; Poquonock, 7 July, 1903, B. H. W.; Cromwell, 14 Aug., 1903, B. H. W.; E. Hartford, 21 Aug., 1903, B. H. W.; Colebrook, 21 July, 1905—June, 1911 (Titus); Branford, 20 Aug., 7 Sep., 1905, H. W. W.; Westville, 3 Sep., 1905, 9 Sep., 1907, W. E. B.; Stonington 7 July, 1906, G. A. Hyslop.

New York: Oscana Lake, Aug., 1891, (Van Dyke coll.); Ithaca, 1895 (Ohio U.) 1885, 18 July, 1 Sep., and 1890, 10 May, and many other dates (Cornell Univ.) Thousand Isles 9–21, Danley Corners 16–Aug.–85, Motts Corners, 23 Aug.,–85 (Cornell U.); Berington, Yates Co., July, 1882, J. B. S. (U. S.

N. M.); Dundee 13–3, Rockaway Bch (U. S. N. M.); Babylon Je 18, G. D. Bradford, Staten Id (A. M. N. H.); Buffalo in many collections; from Dr. Felt (*in litt.*) Albany, Buffalo, Canandaigua, Coeymans, Ithaca, Karner, Mosholu, Marlborough, Newport, Oswego, Phoenicia, Pike, Sheepshead Bay.

New Jersey: Distributed over entire state, (J. B. Smith). N. Brunswick, June, vi–15, Monmouth, Chester ix–1; Sea Isle City 5–29, Jamesburg, June; Woodbury 6–19; Anglesea 6–26, Avalon 7–25, Westville 8–13; Atlantic City 6–24 (coll. J. B. Smith); Anglesea 1–28; Phila. Neck 1-31, Malaga ix–18 (coll. Wenzel); Highlands N. J. (U. S. N. M., Mich. Agr. Coll.); Cape May, Ft. Lee (A. M. N. H.); Highlands 8–7–90, (Soltau) Anglesea 22–7 (U. S. N. M.); Hopatcong (A. M. N. H.).

Pennsylvania: Bucks Co (J. B. S.); Crooked Ck, Allegheny (Felt coll.); W. Park (Wenzel); "Pa" (Horn coll.); Pa (Bolter coll.).

Maryland: See records above under general distribution.

Delaware: Close 1907, records from state.

District of Columbia: Washington 11–8, 11–7 (U. S. N. M.) common (Schwarz).

Virginia: Falls Ch. (Felt list). Common (Schwarz).

West Virginia: Berkeley and other counties (Hopkins); Morgantown (Felt list).

North Carolina: Raleigh 22 Oct., 1901, Newton, Aug., 1902 (Sherman).

Tennessee: Memphis (Titus coll.) 1906.

Texas: Austin, 1901–2 (Brues coll.).

Michigan: Detroit, Sep. 2, Hubbard and Schwarz (U. S. N. M.). Common.

Ohio: N. E. Ohio, 1890 (Webster); Wooster, 1893:(Webster); Lucas Co., 1893 (Hine); Cincinnati 1892 (Dury); Wauseon, April, 1894 (Hine); Sandusky, July 12, 1899; Big Chicken Id. L. Erie, 25 July, 1903, Columbus (Ohio State University); Cleveland, June 23 (Webster); Cuyahoga Falls, 14–viii–04 (Warner, U. S. N. M.).

Indiana: Indianapolis (Fall coll.); Stilesville ix–18 (Wickham coll.); common throughout state (Blatchley).

Illinois: Chicago, 1897–1898, common (Brues); Urbana, ix–26–10 Titus; Cobden ix–25–10, (Titus); in coll. Field Col. Mus: Willow Spr. viii–17–07, viii–31–07; Roby ix–7–06; Cook Co. (Chope); Chicago ix–2, (Brand); Glencoe v–31–09, (Gerhard); Carbondale ix–22–09 (Gerhard).

Wisconsin: Bolter coll; Lugger coll.; Beaver Dam ix–4–10 (Van Dyke).

Iowa: Burlington, April, 1910 (Webster, R. L.).

Kansas: North Topeka, 17 Sep., 1910 (Titus).

Washington: Washington Lake near Seattle v-9-07, ix–9–07 (Van Dyke); Vancouver (G. I. & M. Reeves).

California: Mt. Lake near Presidio Mil. Res. San Francisco, May, '08, (Blaisdell and VanDyke).

Oregon: "*Ore.*" (U. S. N. M.).

British Columbia: Victoria 1902 (Hanham), Harrison, 1903 (Wilmot).

Food Plants and Life History: In Europe this species has several times been reported as injurious locally, but only for short periods. The earliest record I have found is Villa's statement at the time of the outbreak in the region of Lombardy in 1868, when he says that Moretti in a revised edition of Gene's publication in 1853 reports this species as injuring clover, and believes that this referred to a previous serious injury about 1834–35. I have not seen the work mentioned. In 1868 the species caused serious damage in northern Italy so that a commission was appointed to investigate the matter and published several papers giving recommendations.

Targione-Tozzetti in 1879 notes a severe outbreak in the region around Florence; Koppen in 1880 mentions its injuries to agriculture in Italy. Bargagli in his work on the Rhynchophora writes of the species as injurious and in 1884 reports that the previous year it had been excessively abundant. He believed that this was due to the very dry year killing off the predaceous and parasitic insects that ordinarily keep it in check. Bertolini reports it from clover at Trento in 1893. It was again injurious in the region of Florence in 1902–1903.

In America its first notice as an injurious species was in 1881 in New York when there was a severe outbreak and from this place it rapidly spread in all directions year by year. Five years later Arthur of the Geneva station studied the fungus that was then attacking it. This disease keeps the species well in check throughout the eastern states. However, when the species reaches the dry western climates it is probable that it will cause much more serious damage.

The life history of the species was published by Riley in 1882 and a more recent paper by Folsom (1909) gives much additional information regarding its habits and distribution.

The following account is condensed from Folsom's most excellent paper on this subject, supplemented by observations I have made the past fall, winter and spring on the species in captivity and on the grounds of the Bussey Institution and other places around Boston. I have succeeded in forcing the larvæ through to pupation by the middle of March. The beetles of the year lay eggs throughout the fall from September until winter forces them into hibernation.

Folsom states that he rarely found the weevils in early spring, those found being "either dead or in the last stages of decrepitude and evidently incapable of doing anything toward the propagation of their kind."

Eggs are laid in old clover stems, on the outside of green stems, leaf petioles and among young leaves, or on the ground amongst the debris at the base of the plant. In captivity the beetles freely deposited their eggs in the stems of growing alfalfa and clover. As related by R. L. Webster the adults stand head downward boring the hole in which to deposit the eggs with their beak.

Apparently the majority of the eggs hatch in the fall, the young larvæ wintering over in various sizes ranging from those newly hatched of 1.5 mm. length to specimens 5 to 7 mm. long and certainly three-quarters grown. During the winter they may be found inside hollow stems, among the young leaves, or among the dried leaves about the base of the plants. On warm winter days they come out to feed on the young leaves, I have found them feeding in the bright sunshine on warm days in January and February; Glascow also reported finding larvæ feeding at this time of year (Folsom).

In early spring the overwintering eggs begin to hatch and the larvæ that have been hibernating come out on the plants and feed. The very young larvæ eat small holes in the leaves while the older ones cut pieces out of the edge or even cut off young leaves. The damage to clover is sometimes quite severe and alfalfa plants show the riddling still plainer.

The beetles feed on the leaves and stems, both eating off the parenchyma and making feeding punctures in the stems.

Folsom gives the length of the egg-period in as 23 to 45 days. One lot of 54 eggs laid by one beetle in the insectary at Forest Hills were divided, 27 kept inside hatched in 18 days, while those placed outside hatched with an average of 31 days.

According to Folsom the average for the first larval stage is about 9 days; and the others very variable. Larvæ reared by me in 1910–11 passed the first stage in 8–9 days, the second in 10–12, third in 15–16 and spun their cocoons 12–16 days later. The cocoon spinning occupies one or two days,

Pupæ are apparently formed about two days after the cocoon is finished. The pupal period (Folsom) is from 10 to 20 days. Beetles appear in Illinois as early as May 9 and as late as July 15. The period of greatest emergence being "the last week in June."

Copulation does not occur for several weeks or even more than a month after their appearance. Meanwhile they spend their time hidden during the day and coming out at night to feed. Both beetles and larvæ usually feed during the night.

The largest number of eggs reported by Folsom was 40. Taking advantage of their propensity for continued mating I have supplied a female with fresh males and fresh food-plant after each egg-laying period; this combined with a warm room seemed to act as a stimulant and I received 68 eggs. Dissection later showed many undeveloped eggs in the ovaries.

Folsom gives as foodplants "all kinds of clovers and alfalfa as well." In central Illinois red clover is most heavily infested, alfalfa second and white clover third. Webster found that one year in Ohio the white clover was most seriously injured. Lintner reports the larvæ and adults feeding on beans, the latter especially on the pods.

Kleine gives as the food-plants in Europe: *Medicago sativa*, *Trifolium pratense* and *T. incarnatum* and *Helianthus tuberosus*.

Enemies: Riley reported *Collops quadrimaculatus* in the larval stage feeding on the eggs, and *Cicindela repanda* probably preying upon the larvæ. Webster notes that larvæ are eaten by birds and that turkeys (especially), and chickens are very fond of them. In Europe Torka in 1907 reported, evidently quoting from Eckstein, finding the species in the stomach of *Botaurus stellaria*.

The worst enemy of the insect is undoubtedly a fungus disease which attacks the larvae under favorable conditions sweeping them off in great numbers. This disease was first noted by Arthur in New York in 1885 and has since appeared wherever the Phytonomus has been distributed throughout the eastern and central states. Folsom states that it requires

damp and not too cold weather to develop and affects the larvæ in October and November and again in April and May.

This fungus is known as *Entomophthora sphaerosperma* Fres., and is a common disease upon many insects, the only other representative of the Coleoptera reported as attacked is a Lampyrid larva. The list of its hosts includes (Thaxter, 1888); in the Lepidoptera, imago of *Colias philodice* and larvæ of *Pieris;* in Hymenoptera several Ichneumons, and a Halictus; in Diptera, imago of the common house fly (*Musca domestica*) and representatives of several families of small diptera; in Coleoptera as noted above; Hemiptera, *Aphis*, *Typhlocyba*, larvæ, pupæ, imagines; in Neuroptera; imago of *Limnephilus*(?); Thrips in various stages of a species on Solidago. This species of fungus occurs in Europe as well as in America, here being known from Maine to North Carolina and westward into the Mississippi Valley.

The fungus develops in the body of the host, as a network of branching mycelia, some of the branches push through the ventral wall and become attached as rhizoids to some surface; over the body is formed a gray velvety coating of fine threads which have penetrated the skin; on the tips of some of these are formed conidia from these come temporary spores which are shot away for some distance and may thus alight upon another host and begin to grow. Resting spores develop inside the host and probably may thus live over until the next season.

The sick larvæ crawl up the plants during the night, ascending as high as possible, if on a slender stem or a grass blade they coil themselves about it in a horizontal position.

Arthur (1885) states that they die by noon, remaining in this position and during the late afternoon have changed to a velvety gray. By the next morning the larva is only a blackened shriveled mass.

This disease is so destructive to the larvæ of *Phytonomus nigrirostris* and *Hypera punctata* that there is rarely any cause for worry on account of their injurious habits in the Eastern States. When they appear in numbers any season they are nearly all killed before reaching maturity.

Phytonomus eximius Leconte.

Phytonomus eximius:
1876: Leconte: Rhyncophora of N. America, p. 414, no. 4–5, p. 415.
1877: Popenoe: Tr. Kans. Acad. Sc., 5:38–9.
1881: Riley: American Naturalist, 15: 912.
1882: Riley: Report of the Entomologist, p. 111.
1883: Riley: in Rpt. U. S. Dept. Agr., p. 171.
1883: Lintner: 1st Rpt. St. Ent. N. Y., p. 248.
1885: Henshaw: Cat. Coleop. Am. N. of Mex., p. 137, no. 8231.
1898: Beutenmuller: Journ. N. Y. Ent. Soc., 1:40.
1909: Webster, R. L.: Entom. News, 20: 81.

Hypera eximius:
1880: Austin: Supp. Check list Coleop. N. Amer., p. 45, no. 8885.

Adult: (Plate XXVII, fig. 6–8). Length 4.8–5.5 mm. Width 1.5–2 mm.

Black, densely clothed with golden-yellow, rust-red, brownish-black or black scales or some combination of the colors, hairs sparse, usually pale.

Head densely, finely punctured, scales dense on head, especially between the eyes, sparse on beak; *front* narrow, scarcely as wide as beak at tip, about as wide as one eye; *eyes* oval, scarcely elongate, narrowed beneath very slightly; *beak* not as long as prothorax, generally covered with fine punctures which often merge into striæ that extend almost to the tip which is a little widened, apical two-thirds of beak sparsely clothed with long pale or black hairs; *antennæ* black, not densely haired, very long in proportion to size of the insect; scape reaching at least to the eyes, first funicular joint as long as three following, enlarged at tip, second joint as long as third and fourth united, club long pointed, densely pubescent with very fine short hairs.

Prothorax as long as wide, narrowed in front, sides obliquely sloping back for two-thirds of length, then slightly contracted to posterior edge, sides somewhat swollen, impressed behind; dorsum and sides clothed with ribbed scales that are almost quadrate in form, and with a few short pale or white hairs.

Scutellum narrowly triangular, scales yellow.

Elytra at base one-third wider than widest part of prothorax, gradually widening for two-thirds of length where they become almost one-half wider than prothorax, then gradually sloping to the rounded tip; scales as on prothorax, hairs on interspaces very sparse, interspaces flat; punctures of the striæ without hairs. In some specimens the scales are dark yellow with tesselated brown or black spots on alternate interspaces beginning with the sutural area; others are rust-red either uniformly scaled or with spots of brown, yellow or gray scales intermixed, or they may be covered entirely with gray scales.

Venter with entire surface clothed with paler scales and fine pale hairs; these hairs are especially evident in a small area on the mesosternum; abdominal surface often rubbed so that it appears spotted with black; *mesosternal process* between middle coxæ elevated, narrowly linear, ending in a rounded point; *intercoxal process* of first abdominal segment broad; male genitalia (Plate XXIV, fig. 7) with *stem* broad, sides obliquely sloping to a broadly rounded tip.

Legs black, last tarsal joint, especially of hind legs usually pale, femora all clothed with scales, tibiæ and tarsi with pale hairs, front tibiæ in male curved, with a distinct thin process apically on the inside, crown of spines on tibiæ pale yellow.

Map 3. Distribution of *Phytonomus eximius* Lec. and *P. quadricollis* Lec.

Distribution: Type locality, Topeka, Kansas, 2 specimens from E. A. Popenoe, one of which is in the Mus. Comp. Zool., in the Leconte collection.

Dom. of Canada: Manitoba: Aweme, 2–vii–07, 11–June–03, 7–vii–08, 15–viii–08 (all in coll. Norman Criddle).

United States: Illinois: 5 in Bolter coll. Univ. of Ill.

Iowa: Iowa City (coll. Wickham) (R. L. Webster *in litt.*)

Nebraska: "Neb." (collections U. S. N. M., Schaeffer, Fall, Wenzel); Lincoln, H. Soltau, 5–5 (U. S. N. M.); Lincoln, Bruner, May 3 (Mich. Agr. Coll.) Malcolm, vi–20–09, C. R. Oertels, vi–22–09 (coll. Frost); Lincoln, Salt basin, vi–26–09, H. Shoemaker (coll. Wickham); Kearney (coll. Wenzel).

Kansas: "Kan." (Horn coll. Am. Ent. Soc., Mich. Agr. Coll., U. S. N. M., Fall coll.); Douglas Co. May, Bridwell (U. S. N. M.); Wilson Co. 4–17–97 (coll. Cornell Univ.); Benedict Ks, 4–23–96, W. Knaus; Onaga Ks (coll. VanDyke).

Texas: Dallas (Mich. Agr. Coll.); Bolter coll. 1.

Colorado: Florissant June, '07, Cockerell, (2 in Fall coll.): Horn coll. Am. Ent. Soc. 1.

Food plants: Rumex brittanicus and probably other species.

Life History: Popenoe (1877) bred the type specimens from pupae in cocoons found on the leaves of *Rumex brittanicus*. He states that the cocoon is yellow brown, loosely interwoven, broad in outline, and the pupæ very "nervous" when disturbed. Warren Knaus, McPherson, Kansas (*in litt* 1911) states that he collected specimens in copula 23 Apr., 1896 in Wilson Co., Kansas on a species of Rumex and that young larvæ were then present feeding on the leaves and flowers, the season was late and the beetles were disappearing.

Phytonomus quadricollis Leconte.

Phytonomus quadricollis:
1876: Leconte: Rhyncophora of North America, p. 126, no. 8, p. 415.
1885: Henshaw: Cat. Coleop. Am. N. of Mex., p. 137, no. 8235.
1909: Webster, R. L.: Entom. News, 20: 81 (in error).
Hypera quadricollos:
1880: Austin: Supp. Check list Coleop. N. Am., p. 45, no. 8888.

Adult: (Plate XXVII, figs. 3–5). Length 4 mm. Width 1.5 mm.

Elongate, black or "blackish brown", with dense closely set gray or dull yellow small rounded scales; legs pale red.

Head clothed with coarse hairs; front much wider than width of eye, flat; *eyes* elongate-oval; *beak* as long as prothorax, rather slender, at least three times as long as wide; tip slightly enlarged, a few sparse punctures on the glabrous portion, feebly carinate; *antennæ* brownish red, scape reaching to the eyes, smooth, first joint of funicle as long as two following or nearly so, club elongate, second and third funicle joints subequal.

Prothorax square, slightly narrowed in front, sides variable but never more than scarcely rounded; polished with closely set shallow punctures in which the scales and hairs rest.

Elytra much wider than posterior margin of prothorax, oblong-oval, humeri rounded, sides almost parallel, rounded at tips; striæ

impressed, punctured, each puncture with a short white thick hair or seta; a single row of white setæ, short and stout in front and longer behind on each interspace; interspaces not elevated. Setæ on all parts of insect more or less decumbent; scales very evenly, regularly set, so that they appear almost as if in rows on the interspaces; color very uniform dull yellow or dirty white or gray. In one specimen there is almost a complete tesselation, with pale brown quadrate maculæ on the yellow ground.

Venter with scales usually paler and on abdomen intermixed with transverse rows of short white hairs; mesosternal process between middle coxæ long, narrow, enlarged at tip, elevated; intercoxal process of first abdominal segment broad at base and rapidly curving to a blunt point. Stem of male genitalia (Plate XXIV, fig. 8) gradually and evenly rounded to the blunt tip, sides parallel for two-thirds of length, edges not strongly curved inward.

Legs pale red, claws dark red; femora only little curved; femora clothed in front with scales; tibiæ and tarsi and usually the femora clothed behind with long stout hairs; tibiæ and tarsi clothed in front with hairs or scales or both, crown of spines on posterior tibiæ short and yellow; sometimes all the legs are entirely covered with short hairs or setæ and with scales.

Distribution: (See Map 3). Type locality, "Dacota," 1 specimen in Leconte collection, Mus. Comp. Zoolog.

I have seen a number of specimens of this species collected by Norman and Evelyn Criddle on *Rumex venosus* along streams at Aweme, Manitoba (23–vi–08, Criddle coll.) (v–26–04, Wenzel coll.), vi–11–03, (Wickham coll.) and also one specimen in the Horn collection (Am. Ent. Soc.) from Colorado.

R. L. Webster (1909) records the species from "Ykn," Las Vegas, N. Mex., and Wyoming (Bolter coll.), but an examination of these specimens shows that they do not belong in the tribe Hyperini.

Phytonomus comptus Say.

Phytonomus comptu
1831: Say: Desc. of N. American Curculionidae, p. 12-13.
1834: Gyll[illegible]al in Schönherr: Gen. et sp. Curc. 2(pt. 2): 384.
1842: Gyll[illegible]ial in Schönherr: Gen. et sp. Curc. 6(pt. 2): 380, no. 70.
1853: Melsheimer: Cat. Desc. Coleop. United States, p. 95.
1859: Leconte: Comp. Writing of Thomas Say, 1: 274.
1873: Crotch: Cat. Coleop. of N. Amer., p. 118, no. 6992.
1878: Hubbard & Schwarz: Proc. Am. Phil. Soc., 17: 663.
1879: Dury: Journ. Cin. Soc. Nat. Hist., p. 14.
1880: Zeisch & Reinecke: List Coleop. vic. Buffalo, p. 14.
1881: Zeisch & Reinecke: Bul. Buf. Soc. Nat. Hist., 4: 14.
1881: Riley: American Naturalist, 15: 912.
1882: Riley: Report of the Entomologist, p. 111.
1883: Riley: in Rpt. U. S. Dept. Agr. f. 1881–2, p. 171.
1883: Lintner: First Rpt. St. Entom. N. Y., p. 248.

1883: Brodie & White: Check List Ins. Dom. Canada, p. 47.
1885: Henshaw: Cat. Coleop. Amer. N. of Mex., p. 137, no. 8230.
1890: Smith: Cat. Ins. N. Jersey, p. 250.
1898: Beutenmuller: Journ. N. Y. Ent. Soc., 1: 40.
1899: Smith: Cat. Ins. New Jersey, p. 343.
1902: Dury: Journ. Cin. Soc. Nat. Hist., 20: 182 (sep. p. 76).
1902: Ulke: Proc. U. S. N. Museum, 25: 355. (Dist. Columbia list).
1902: Wickham: Bul. Lab. Nat. Hist. St. Univ. p:
1907: Pierce: Ann. Rpt. Neb. St. Board Agr. p. 258.
1909: Webster, R. L.: Entom. News, 20: 81.
1910: Smith: Cat. Ins. New Jersey, p. 381.

Hypera compta:
1871: Gemminger & Harold: Cat. Coleoptera, 8: 2381.
1880: Austin: Supp. Check List Col. N. America, p. 45, no. 8884.

Phytonomus diversus:
1833: Dejean: Cat. Coleop. coll. Dejean, ed. 2, p. 263.
1834: Gyllenhal in Schönherr: Gen. et sp. Curc. 2 (pt 2): 371.
1837: Dejean: Cat. Coleop. coll. Dejean, ed. 3, p. 286.
1842: Gyllenhal in Schönherr: Gen. et sp. Curc., 6 (pt 2): 372.
1873: Crotch: Cat. Coleop. N. America, p. 118, no. 6992a.

Phytonomus rumicis var. *diversus.*

Phytonomus rumicis var. *comptus:*
1901: Petri: Monog. d. Coleop.-Tribus Hyperini, p. 129, 202.
1901: Petri: Bestimm.-Tabel. Hft. 44, Hyperini, p. 40.

Original description: Say, 1831, p. 12–13:

"2. P. comptus.—Elytra with subquadrate, brown spots. Inhabits United States.

"Body cinereous-olivaceous covered with small scales; rostrum shorter than head and thorax, rather narrower at base; antennæ and feet rufous; thorax somewhat rounded, with a much dilated brown, somewhat metallic vitta (p. 13) scutel small triangular; elytra with slightly impressed, but punctured striæ, interstitial lines flat, with more or less brown quadrate spots, particularly near the suture, where they are alternate.

"Length much over three-twentieths of an inch."

Adult: (Plate XXIV, figs. 1, 3, 5, 6, 17; Plate XXVIII, figs. 1–4). Length 3.3–5 mm. Width 1.2–1.7 mm.

Rich brown to reddish black and more rarely black, thorax usually darker than the elytra; elongate; closely covered with small scarcely striate rounded scales. Antennæ and legs ferruginous.

Head small, very finely punctured, beneath with fine transverse lines; covered above and below with very narrow blunt scales, on the sides wider and more numerous; these scales are almost hairlike in character; *eyes* oval, slightly elongate without a fovea behind; *front* never as wide as an eye; *beak* about as long as the prothorax in the females, shorter in the males; slightly widened at the tip which is almost always entirely red, never with a carina, rarely curved strongly, usually with many short, scale like hairs on the black portion and a few long slender hairs near the tip on the polished portion, these are set in minute punctures; *antennal groove* not deeply curved downward, roughened, above it on the beak an elongate depression; *antennæ* only slightly hairy, scape not nearly reaching to the margin of the eyes, polished, equal in length to the

funicle, first funicle joint nearly twice as long as second, second longer than third, seventh joint broader and shorter than the others, last joint of club more elongate, longer than others, all covered with fine pubescence; antennæ inserted about one-third back from tip of beak.

Prothorax slightly longer than wide, widest in the middle, anterior and posterior margins of almost the same width, sides rounded and impressed posteriorly, a deep impressed groove near the anterior sternal margin which extends upwards on the sides gradually becoming indistinct; anterior margin below with a fringe of hair projecting forward over the suture; punctures rather coarse and dense in each puncture lies a small narrow truncate or rounded scale.

Scutellum small triangular, elongate and usually covered with finer paler scales.

Elytra elongate-oval, narrow in front, sloping gradually outward for three-quarters of length and then quickly narrowed, from the side only slightly declivous behind; striæ distinct, punctured, interspaces scarcely elevated, scales arranged irregularly on interspaces as compared with *quadricollis*, but much more regular than in other species, often overlapping, but never lying across the striæ; *no setæ in the strial punctures.*

Venter covered with fine generally paler scales, abdomen flatter in male than in female and with a faint indication of an impression on the first segment; mesosternal process between the middle coxæ elevated for half its length and broadly triangular, then curved backward contracted and again enlarged near the truncate point; the process of the metasternum appears to fit into a socket on the under side of the mesosternal process; intercoxal process of third segment of abdomen not as wide as coxa, projected further forward than usual. Male genitalia (Plate I, figs. 5–6) with *stem* having elongate parallel sides for two-thirds of the length then curved smoothly in to the rounded point.

Legs with all the coxæ, and femora in front clothed with narrow scales, tibiæ and tarsi with hairs which are sparsely set almost in rows and sometimes short and stout; crown of spines on hind tibia short and stout, spur of hind tibia very short, stout and red; tarsi above and claws usually darker than remainder of legs; pad on the third joints long and pale.

The color of the adult beetle varies extremely; from a large number of specimens bred by Dr. J. B. Smith, at Trenton, N. J., I have found almost all the varieties sent from various localities over the United States. The prevailing color seems to be rust-red, which is evidently the color of the specimens described by Gyllenhal as *diversus*. Other specimens are brown, gray, grayish-green, metallic-red, gray or gray-green; others tesselated over the entire elytral surface with brown and black maculæ on a background of red or brownish yellow scales; a few are metallic greenish-black. The specimens sent Schoenherr by Say are evidently small males of the obsoletely tesselated reddish forms. The relation with *P. rumicis* is only superficial and extends neither to the thoracic form, elytral markings, scale shape or genital structure. The metallic vitta mentioned by Say as occurring on the prothorax appears

usually in the spotted forms and is rather rare; the common elytral basal spot so characteristic of the genus is indistinct or absent

Egg: unknown.

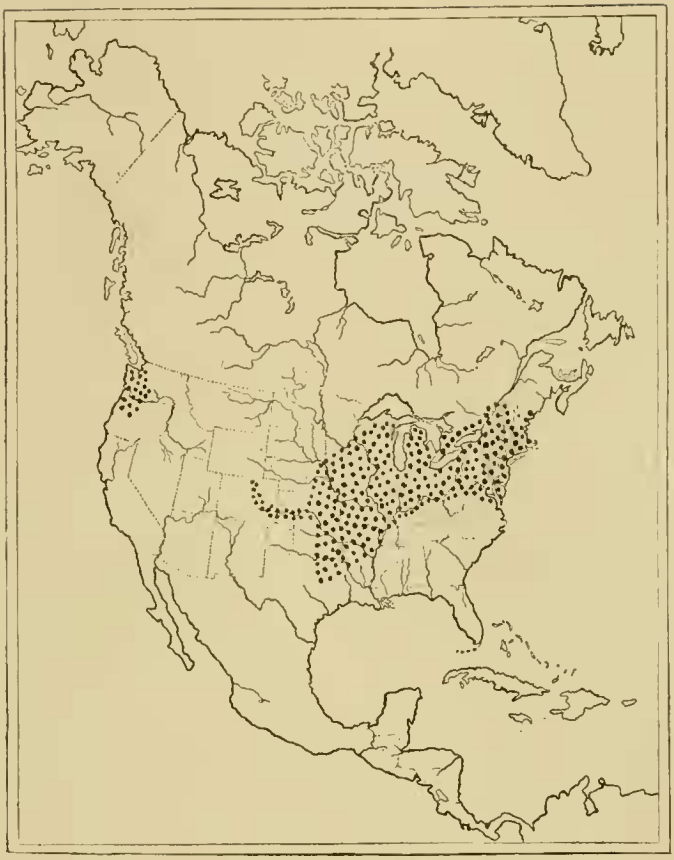
Larvæ: (Plate XXVIII, fig. 7). First stage not seen.

Second or third stage: 4.5 mm. long, .6 mm. wide in the middle, dark brown above, pale below, Hairs very long and pointed, head jet black, first thoracic segment pale.

Fourth stage: 5–6 mm. long, 0.7–0.8 mm. wide in middle, very dark brown above except first thoracic segment and interrupted pale lines; paler on sides and below. A central dorsal row of pale spots occurs between the tubercles from the first abdominal to the anal segment; only faintly indicated on the thoracic segments. Tubercles of the abdominal dorsal segments in two rows, the first containing one tubercle on each side of the dorsal median line, the second having four pairs of tubercles, these are jet black and between them there are always pale spots; first lateral enlargements on each segment with a pair of black tubercles, second enlargements each with a single tubercle; anal segment on each side with a pair of tubercles in front of the second and third tubercles of the second row; last segment with the four tubercles of the second row on each side arranged in a diamond, more elongate laterally. Each tubercles is set with a long slender dark hair, none of the hairs appearing blunt or truncate. On the thorax the tubercles are more numerous on the first segment but on the others arranged as on the abdominal segment but without evident pale spots between. (Described from alcoholic specimens loaned by Dr. J. B. Smith, collected in June on Polygonum at Trenton, N. J.) The colors of the living larvæ may be somewhat different from those of alcoholic specimens and the arrangement of the thoracic tubercles, especially those on the first segment could be better understood from non-shrunken specimens.

Cocoon: (Plate XXVIII, fig. 5). 4–5 mm. diameter, coarsely reticulate, of brown coarse threads, usually almost globular. (Specimens from Trenton, N. J., Indian Territory, Columbus, Ohio and Pegrim, Ill.)

Pupa: (Plate XXVIII, fig .6) 4 mm. long by 1.8 mm. wide across the base of the wing-pads. Anterior line of prothoracic hairs close to margin, first three pairs in front, fourth and fifth on side; the two central pairs are on a line, almost with the fourth and fifth anterior and form a square; three posterior pairs on a curved line near the hind margin about equidistant from each other and the inner one the same distance from the posterior hair of the central pairs; all of these hairs very long and slender; hairs on the head and beak not so long; transverse rows of setæ on the dorsal abdominal segments and rows of hairs on the terminal segment. Pupa dark on head, base of wing pads, parts of legs, metathorax above, and on parts of abdomen. (Described from one specimen from Dr. J. B. Smith, same lot as larvæ.) The coloration of the specimen appears to have been affected by the alcohol in which it is preserved. Some of the segments are somewhat shrunken, especially on the abdomen.



Map 4. Distribution of *Phytonomus comptus* Say.

Distribution: Type locality, "United States," Say 1831.

Generally distributed over the United States, Ontario and perhaps other parts of Canada. Ranging from Michigan to Texas, and from the Atlantic seaboard to the Rocky Mountains, also occurring in Oregon and Washington.

Dominion of Canada: "Can." (Horn coll. Am. Ent. Soc.; Mus. Comp. Zool.; Coll. Mich. Agr. Coll.); Grimsby, Ont., (Pettit) (coll. Mich. Agr. Coll.; Amer. Entom. Soc.)

United States: Massachusetts: "Mass." (coll. Blanchard; coll. Horn, Am. Ent. Soc.); Tyngsboro 6–12–89 (Blanchard); Lowell (Blanchard); Chicopee 3, (Cornell Univ.); Framingham vi–24–08 (Frost); Sherborn vi–16–09 (Frost); Andover vi–9–07 (Frost).

New York: "N. Y." (Bolter coll.; U. S. N. M.; Am. Ent. Soc.; Dietz coll. Mus. Comp. Zool.); Staten Id, 7–6–91 (Fall); Long Island, Staten Island (Linell, U. S. N. M.); Buffalo (Am. Ent. Soc.).

New Jersey: "N. J." (U. S. N. M.); Berkeley Hts. (Bischoff coll.); Ft. Lee (A. M. N. H.); Phila. Neck, Westville 4–26–, 6–23, Gloucester 8–17 (Wenzel coll.); in list Insects N. J. 1910 are recorded: Hopatcong (Palm); Ft. Lee (Schaeffer); Hudson Co. (Linell); Newark Dist. (Bischoff), Westville, Gloucester; and "on Polygonum;" I have also seen specimens of adults, larvæ and pupæ from Trenton (J. B. Smith).

Pennsylvania: "Penn." (Horn Coll. Am. Ent. Soc.; Melsheimer, Mus. Comp. Zool.).

District of Columbia: Washington 7–11, 14–4, 8–4 (U. S. N. M.).

Michigan: South Haven 6–1–91 (Mich. Agr. Coll.) Grand Ledge 6–6 (Hubbard and Schwarz, U. S. N. M.); Detroit, June (Hubbard & Schwarz); "Mich. 144046" (Leconte coll. Mus. Comp. Zool.); also recorded in Wickham's Lake Superior list.

Ohio: Columbus (Ohio State Univ. coll.); recorded by Dury from vicinity of Cincinnati.

Indiana: "Ind." (coll. F. M. Webster; coll. Blanchard); Vigo Co., 5–29–92, 5–21–93, 6–25–92, 6–7–93, 6–10–98, 4–23–03, 7–8–02 (Blatchley).

Illinois: "Ill." (Bolter coll.); "N. Ill.". (Lugger coll.; Peabody coll. Ill. St. Lab. Nat. Hist.; Dietz coll. Mus. Comp. Zool.; Bolter coll.); "S. Ill. Soltau" (U. S. N. M.); Algonquin 17–July–09 Nason 222; Pegrim 4–Oct.–02 (Titus, coll. Ill. St. Lab. Nat. Hist.); the Nason specimen is in the Fall collection.

Missouri: "Mo." (Dietz coll. Mus. Comp. Zool.; Bolter coll. Ill. St. Lab.).

Iowa: Wickham coll. and Dietz coll. (Mus. Comp. Zool.).

Arkansas: Blanchard coll.

Indian Territory: "I. T." (U. S. N. M.) one specimen with cocoon and another specimen of the same form and color.

Texas: Columbus 8–11 (U. S. N. M.).

Nebraska: Horn coll. (Am. Ent. Soc.); Mus. Comp. Zool.

Colorado: Colo. Springs (R. L. Webster *in litt*); Dixon Can. on willow, 30–June–92 (Gillette) and Spring Canon (Wickham's list). These two latter localities are west of Ft. Collins in the edge of the foothills.

Oregon: Am. Mus. Nat. Hist. 1.

Washington: "W. T." two in Horn coll. (Am. Ent. Soc.).

The specimens reported by Dejean and Schönherr were given as from "America boreal." Probably the Say specimen of *comptus* was from the Mississippi valley region, though his statement "United States" would lead one to believe that he had specimens from a number of places.

Food Plants and Life History: Riley (1881) reports breeding this species from "*Polygonum nodosum.*" Dr. Smith bred it from a species of *Polygonum* in New Jersey. I have seen specimens from Columbus, Ohio, (Osborn), with the cocoon still attached to a leaf that appeared to be Polygonum. Through the kindness of Dr. S. A. Forbes I have permission to use some notes made by me while connected with the State Entomologist's office several years ago.

In October, 1902, I found several species of larvæ feeding on leaves and flowers of a Polygonum (identified for me by Dr. Gleason as probably *P. hartwrightii*) on the Hartwell ranch near Pegrim, Ill. At that time the country was flooded with water, only the top of the plants being above the water. The larvæ were almost full grown and some were already in the cocoons, others had changed to pupæ. The cocoons were made on the upper side of the leaves, the edge being bent over to aid in concealment. I bred a number of adults and some parasitic Hymenoptera. Dr. Forbes very kindly loaned me this material and from it Mr. J. C. Crawford of the U. S. Nat. Museum has described ——— ———. The parasitic pupæ of this species were naked, jet black and formed in the cocoon of the host.

In Biol. Cent. Am. Coleop. v. 4, pt. 4, p. 2, this species is incorrectly referred to as probably a synonym of *P. rumicis.*

Phytonomus diversipunctatus Schrank.

Curculio elongatus:
1792: Paykull: Monog. Curc. no. xlv. (nec. Fab. 1775).
1800: Paykull: Fauna Suecica; Insecta, 3:236, no. liii.
1834: Sahlberg: Ins. Fennica, 2: 49, no. 28.

Rhynchaenus elongatus:
1813: Gyllenhall: Insecta Suec. 3:99, no. 31.
1820: Billberg: Enum. Insect. p. 42.
1840: Zetterstedt: Ins. Lapponica, p. 180, no. 11.

Hypera elongata:
1821: Dejean: Cat. coll. Coleop., ed. 1, p. 89.
1826: Sturm.: Cat. Ins. Sammlung, p. 157.
1848: Walton: Ann. Mag. Nat. Hist., (2) 1:300.
1849: Walton: Stett. Entom. Zeit., p. 258.

1869: Krąatz: Verz. Kafer Deutsch., p.
1871: Gemminger & Harold: Cat. Coleop., 8: 2382.
1871: Kirsch: Berl. Ent. Zeit., 15: 190.
1877: Stein & Weise: Cat. Col. Eur. ed. 2, p. 143.
1880: Austin: Supp. Check List Coleop. N. Amer., p. 45, no. 8882.
1884: Bargagli: Rass. Biol. Rine. Europei, p. 93.
1884: Bedel: Col. Bassin de la Seine, p. 258, no. 13 and p. 78.
1881: Heyden: Cat. Coleop. Sibiria, p. 166.
1883: Weise in H. R. & W. Cat. Col. Eur., p. 159.
1889: Fauvel: Rev. Entom, 8: 157.
1891: Fowler: Brit:: Coleop., 5: 230, no. 234.
1891: Weise in H. R. & W.: Cat. Coleop. Eur. p. 304.
1896: Heyden: Cat. Coleop. Sibiria, ed. 2, p. 152.

Phytonomus elongatus:
1826: Schoenherr: Curc. dispos. meth. pt. 4, p. 175.
1829: Gebler: Ledebour Reise d. Altai, p. 168.
1830: Gebler: Bemerk. d. Ins. Sibiriens vorz. d. Altai, 3: 168.
1833: Dejean: Cat. Coleop. coll. Dejean, ed. 2, p. 263.
1834: Gyllenhal in Schönherr: Gen. et sp. Curc. 2 (pt) 2: 374, no. 9.
1837: Dejean: Cat. Coleop. coll. Dejean, ed. 3, p. 286.
1842: Bohoman in Schönherr: Gen et sp. Curc. 6 (pt 2): 369, no. 44.
1843: Sturm: Cat. Coleop. Kafer Sammlung, p. 201.
1844: (Dohrn): Cat. Col. Europe, p. 52.
1848: Gebler: Bul. Imp. Soc. Mosc. 21: 354.
1849: (Dohrn): Cat. Col. Eur. p. 61.
1849: Gaubil: Cat. Syn. Coleop. d'Eur. et d'Alg., p. 156.
1849: Redtenbacher: Fauna Austriaca, Die Kafer, p. 805.
1853: Zebe: Syn. d. bisher in Deutsch. aufgef. Coleop. p. 75.
1855: Jac. du Val: Gen. Coleop. d'Europe, p. 109.
1857: Lentz: Neue Verz. d. Preuss. Kafer, p. 124.
1858: Matheiu: Ann. Ent. Soc. Belg., 2:197, no. 192.
1858: Dohrn: Cat. Coleop. Eur. p. 79.
1858: Redtenbacher: Fauna Austriaca, Die Kafer, ed. 2, p. 726.
1859: Schiodte: Berliner Entom. Zeit., p. 141.
1862: Schaum: Cat. Col. Eur., p.
1865: Thomson: Skand. Coleop., 7: 164, no. 6.
1866: de Marseul: Cat. Coleop. Eur. et. conf., p. 100, no. 40.
1868: Capiomont: Rev. d. Hyperides, p. 193, 283.
1876: Leconte: Rhyncophora of N. America, p. 125.
1877: Heyden: Jahrb. Nassau. Vereins, 29: 312.
1878: Schneider & Leder: Beit. kennt. Kauk. Kaferfauna, p. 287.
1881: Everts: Tijd. v. Entom., 24: 40.
1884: Bargagli: Bul. Ent. Soc. Ital., 16: 166.
1885: Henshaw: List Col. Am. N. of Mex., p. 137, no. 8228.
1889: Hamilton: Tr. Am. Ent. Soc., 16: 155, no. 455.
1891: Seidlitz: Fauna Transsylv. p. 676.
1893: Everts: Tijd. v. Entom., 36: 81.
1901: Petri: Monog. Coleop.-Tribus Hyperini, p. 175, 201.
1901: Petri: Bestim. Tab. Coleop. Hft. 44, Hyperini, p. 29, 37.
1903: Everts: Coleop. Neerlandica, p. 602.
1906: Weise in H. R. & W. Cat. Col. Europ., p. 656.
1910: Kleine: Entom. Blatter, 6: 200.

Curculio diversipunctatus:
1798: Schrank: Fauna Boica, 1 (pt 2): 494, no. 546.

Hypero mutabilis:
1821: Germar: Germ. & Zincker Mag. 4: 341, no. 13.
1869: Giebel: Verz. z. Mus. Halle Wittenberg, p. 44, no. 25.

Phytonomus mutabilis:
1834: Gyllenhal in Schönherr: Gen. et sp. Curc., 2 (pt 2): 374, no. 10.
1844: (Dohrn): Cat. Col. Eur. p. 52.

Hypera punctulata:
1821: Dejean: Cat. coll. Coleop., p. 89. (Credited to Ziegler).
Hypera elongata var. *variabilis:*
1821: Dejean: Cat. Coleop. coll. ed. 1, p. 89 (Credited to Ziegler).
Phytonomus elongatus var. *variabilis:*
1833: Dejean: Cat. Coleop. coll. Dejean ed., 2, p. 264.
1837: Dejean: Cat. Coleop. coll. Dejean, ed. 3, p. 286.

Original description: Schrank: 1798, p. 494–5:
"Curculio diversipunctatus.
Wohnort:—Um Gern.

Ausmessung.

Lang vom Grunde des Ruckenschildes bis zum After ..... 2½′
Breit uber die Flugeldecken ..... 1½′

Anm. Die Fohlhorner, Schienbeine, und Fussblatter muschelbraun; Russel und Kopf braunschwarz, erhaben punctirt, mit rostgelben einzelnen sehr kurzen Harchen in den Vertiesungen. Die Flugeldecke (denn es ist nur eine einzige, ohne alle Nahe, die zugleich die Seiten des Hinterleibes ziemlich an der Bauch hinab bedeckt) schwarzlicht braun mit Punctreisen; die Puncte entfernt, vertieft. Die Flugeldecke ist mit niederliegenden grauen sehr kleinen Haaren dicht bedeckt, die ihr das Ansehen geben, als wenn sie mit rothlichen Puncten dicht besaet ware.

Vielleicht ist dieser Kafer Hrn. Herbsts *Curculio suspiciosus* und wenn das ware, so musten unsere beiderseitigen Benennungen in die viel bessere; Curc. Millefolii abgeandeart werden, indem die Larve des Herbstichen Kafers dei Blatter der Schaafgarbe abweidet."

Adult: (Plate XXVII, figs. 1–2). Length 5–11 mm. (according to Capiomont, although Petri saw no specimens as large as 11 mm.) Width 6 mm. (measured from three specimens Lignitz, Hildesheim, and the Greenland specimen in the Mus. Comp. Zoology).

Body elongate, black, rather stout, scales cleft to the base, in the specimens seen the pubescence always gray or brown, very uniformly distributed and generally of an uniform color.

Head with front as broad as width of eye or broader, flat, densely pubescent; *eyes* nearly circular in outline; *beak* scarcely narrower than front at base, about, two-thirds as long as prothorax, densely punctured, punctures often in irregular striæ, keel at base very indistinct, a long groove above the antennal insertion; *antennæ* inserted near the tip of the beak, pale reddish brown or reddish yellow, club darker, scape reaching over the edge of the eyes but not to their middle, not as long as the funicle, first and second funicular joints very long, the first the longer, the second as long as third and fourth united, club elongate oval, pointed, densely pubescent, The fifth funicle joint is much the smallest.

Prothorax broader than long, widest in front of the middle, strongly rounded, sides densely punctate, the punctures forming irregular striæ, dorsum densely punctured, clothed with brown hairs, no scales present, and sometimes show a median and two side lines that are paler than the rest of the prothorax.

Elytra narrow at base, only slightly wider than the thorax before the middle; humeri not very prominent, sides of elytra obliquely widened

until the elytra become one-third wider than at base; deeply strongly punctate in the striæ; interspaces strongly elevated (less strongly so in female according to Petri, but I can see no difference); scales gray or brown, hairs brown and never occurring in single rows on the interspaces, rather short and depressed. Scales cleft to the base, processes not elongate.

Venter sparsely clothed with scales and hairs, the former often metallic and not so deeply cleft as on dorsum, gray or gray-green; mesosternal process between the middle coxæ elevated, narrowly triangular at the point; intercoxal process of first abdominal segment broad and subtruncate at tip, last abdominal segment longer than two previous ones united, a distinct depression on the first segment in the median line that extends onto the metasternum (at least in the male, the Greenland specimen has this portion hidden).

Legs rather short, stout, femora in male nearly clavate, anterior tibiæ of male slightly curved, hind tibiæ with a curved spine (said by Petri to be long) inside at the tip, crown of tibial spines short, stout, yellow. All the legs sparsely clothed with gray or silvery gray hairs. The mucronate process on hind tibiæ appears to be widened at the tip and slightly emarginate.

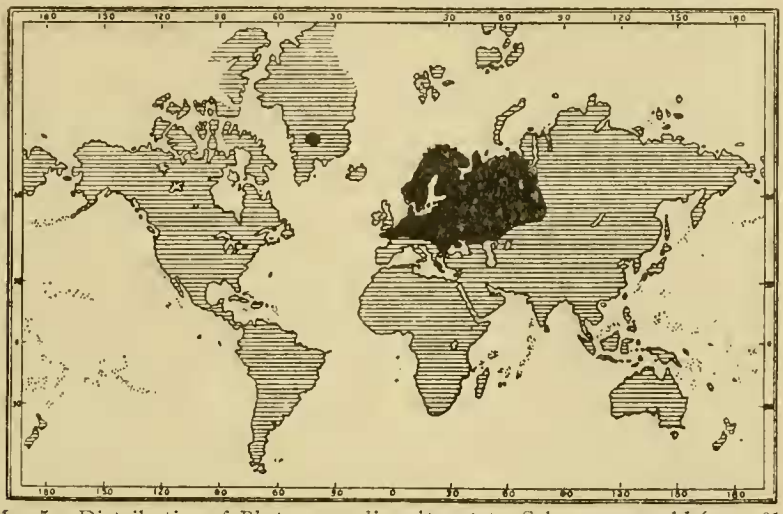
One of the specimens seen shows a tendency to be tesselated on the alternate interspaces beginning with the sutural one, the maculæ being brown on a gray background, but they are very indistinct.

Larvæ: Lucas von Heyden (1877) in his Kafer Nassau states that his father, C. H. von Heyden, took the larvæ of this species when sweeping for insects in a meadow back of Offenbach (Germany) in May, near the end of the month; they were green with a white dorsal median line and in June changed to pupæ without spinning a cocoon! "*Ohne*" is quoted either to emphasize the fact or to note that it was so in the notes of his father. He quotes then the description of the larvæ of *Phy. plantaginis* given by DeGeer, stating that the larvæ of *Phy. elongatus* is much like this description. However *plantaginis* spins a cocoon as both DeGeer and Heyden note and DeGeer's description would fit almost any green Phytonomus larva.

Distribution: The species was described by Paykull from Sweden as *Curc. elongatus*. Schrank's specimens of *diversipunctatus* were from "Gern." Capiomont reports the species from North and Middle Europe, N. France, Belgium and England. Petri from E. Prussia and various points in Germany, Austria and Hungary.

The species is here included because of a single specimen received by Leconte from Chr. Drewsen from Greenland and now in the collection of Mus. Comp. Zool. at Cambridge, Mass. This one specimen is identical with European specimens I have in my collection.

The name *elongatus* is preoccupied by a Fabrician species (1775), and must give way to *diversipunctatus* of Schrank or *mutabilis* Germar (1821). Germar states under his description of *mutabilis* that it is scarcely different from *diversipunctatus* Schrank. A comparison of the two descriptions leads me to believe that they are the same species. So far as I can ascertain no one has since Schönherr's Monograph mentioned Schrank's species, while *mutabilis* is generally considered a synonym of *elongatus*.



Map 5. Distribution of *Phytonomus diversipunctatus* Schr. over world (page 61).

The species appears to be more common in the northern parts of Europe and is recorded by Zetterstedt and others from Greenland, Finland, Norway and Sweden. Gebler records it from Barnaul, Siberia, as rare. Walton states the Stephens, Curtis, and other early English references to this species are incorrect, that they did not possess "*elongatus*" and that it is doubtful whether it occurs in the British Isles. Fowler says very rare, but I believe he is referring to the earlier writers' notice of the species and not to any records that were certain. I have been unable to find further references to the names *palustris*, *variabilis* and *punctulata* than those given in the Dejean catalogues. It does not appear to me that the Dejean species were really described. Gyllenhal's *palustris* is certainly not this species.

Kleine gives as food plants *Plantago major* and *P. media*.

Phytonomus seriatus Mannerheim.

Phytonomus seriatus:
1853: Mannerheim: Bul. Soc. Imp. Mosc., 26 (pt 3): 107, 243, no. 228.
1873: Crotch: Cat. Coleop. of N. Am., p. 118, no. 6993.
1889: Hamilton: Trans. Am. Ent. Soc., 16: 155.
1909: Webster, R. L.: Entom. News, 20: 81.

Hypera seriata:
1871: Gemminger & Harold: Cat. Coleop., 8: 2387.
1889: Fauvel: Revue Entom., 8: 157, no. 458.

Phytonomus pubicollis:
1909: R. L. Webster: Entom. News, 20: 80.

Original description: Mannerheim, 1853, p. 243:

"228. *Phytonomus seriatus: oblongus, niger, dense brunneo-aureo-pubescens et squamulosus; antennis pedibusque rufescentibus; rostro breviore, parum arcuato; thorace crebre punctulato, convexo, utrinque antrorsum rotundato, lineis tribus e pilis pallidoribus flavescentibus notato, elytris subtiliter tenue e pilis palpunctulatis, sutura infuscata, interstitiis alternis 3, 5 et 7 nonnihil elevatioribus pilis flavogriseis densius obductis, 1, 3, 5 et 7 maculis nigris seriatis. Longit. sine rostro 3 lin. Latit. 1 1-3 lin.*

"*Habitat in insula Kadjak, ubi mense August exemplare singulum in baccis Rubi cepit D. Holmberg.*

"*Ph. suspiciosus* Herbst, Schonh. (*militi* Gyllenh.) *affinis, sed thorace angustiore, densius squamoso, subtilius punctato, ante medium et non in ipso medio-rotundato-dilatato, elytrisque longioribus, levius striato-punctatis, maculis nigris in series quatuor regulares dispositis ab illo dignoscendus.*"

Adult: (Plate XXIX, figs. 6–7). Length 5.5–5.7 mm. Width 1.8 mm.

Body black and legs dark, antennæ rufous, club darker; oval, closely finely covered with broadly emarginate hairs and scales that are split almost to the base.

Head clothed with thick hairs which are usually notched at the tip; distance between the eyes as great as the width of the eye in the female and almost as wide as the length of the eye in the male; *eyes* scarcely oval, medium in size; *beak* stout, not as long as the prothorax, at the tip wider than at base; hairs dense and long, simple at the tip, dorsal carina scarcely evident but the elongate depression above the antennal insertion is very plain, tip smooth somewhat elevated and with two small punctured side grooves; mouth parts reddish; many small punctures scattered over the beak, especially near the tip; *antennal grooves* not smooth polished; *antennæ* with scape smooth, polished, enlarged at tip, not reaching to the eyes and shorter than the funicle; first funicle joint slightly longer than second and is twice as long as third; club very dark, almost black, elongate oval, pointed and densely pubescent with pale hairs.

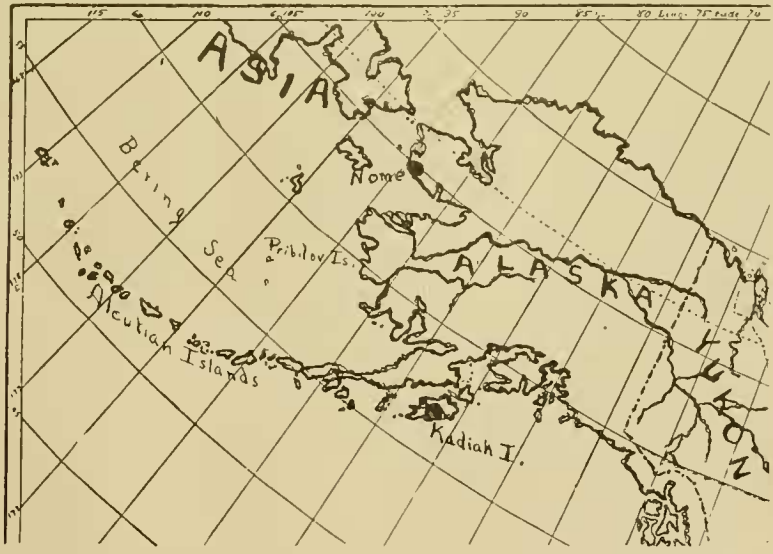
Prothorax polished, closely deeply regularly punctured, narrower anteriorly, widest about one-third of distance from front where it is almost as wide as the elytra at the base, sides abruptly drawn in to the venter, closely densely covered with long thick hairs which are deeply broadly notched at the tip.

Elytra broadly elongate-oval, almost as wide at tip as at base, humeri not prominent, elytra gradually widened for two-thirds of their length and then abruptly obliquely narrowed to the truncate tip; striæ deeply punctured, interspaces elevated, the alternate ones beginning with the sutural space more so, all with fine sparse punctures. Scales of the elytra cleft to the base, fine and very elongate, making a dense covering; long white hairs present on posterior portion of interspaces, remainder of the elytra with interspaces having scattered black and white hairs, more or less decumbent.

Venter clothed with deeply cleft scales, very dense on the sternal portion, rather sparse on the abdomen, last segment distinctly longer than the two previous and in male with a shallow impression near the center; third segment deeply impressed back of the intercoxal process which is broad and gradually curves until near the middle when it abruptly terminates in a sharp triangular point. Male genitalia with the stem broadly rounded at the point. Mesosternal process between the middle coxæ elevated, narrow linear. In the single female I have seen there is at the apex of the seventh abdominal segment a deep impression.

Legs with femora black and densely clothed in front with deeply cleft scales, tibiæ and tarsi very dark red, clothed with fine long silvery hairs, hind tibiæ slightly curved, front tibiæ more strongly so, hind tibiæ with a prominent mucronate process which at the apex is bifurcate in the male; the process scarcely evident in the female.

The tessellation in these specimens is remarkably different and consists of a mixture of gray and brown scales with very small maculæ of black scattered over the interspaces; on the thorax there is an indistinct trilineation, the outside paler lines being very narrow; some of the scales are metallic.



Map 6. Distribution of *Phytonomus seriatus* Mann.

Distribution: Type locality: Kadiak Island, Alaska, one specimen collected by H. J. Holmberg in August, 1851. Mannerheim relates that Holmberg was picking raspberries and found this, the only beetle taken on the island, on a berry.

Through the kindness of E. C. Van Dyke and of Prof. Trevor Kincaid I have had the opportunity of examining three specimens of this species. One very perfect male (coll. Van Dyke) collected by Trevor Kincaid on Pribilov Islands viii–15–97; and a fine female collected by Mr. Kincaid on St. Paul Island, viii–15–97, and loaned from his collection; the third a specimen collected by Mr. F. E. Blaisdell at Nome, Alaska, it is also a male and a very dark form with the scales much sparser and grayer. The specimen belongs to Mr. Van Dyke. Both males have the tip of the penis projecting and have the mucronate process at the tip of the hind tibiae. Mr. Kincaid (*in litt.*) states that he has another specimen remaining from those collected by him.

Prof. Washburn sent me from the Lugger collection, one specimen of this species collected in "Alaska." This is probably the specimen mentioned as *P. pubicollis* by R. L. Webster (1909).

In the collection of the U. S. Nat. Museum are several specimens of this species collected, according to Mr. Schwarz, by the International Seal Expedition.

This is an interesting species on account of its scale and hair formation bringing it between *pubicollis* and *trivittatus*. Further collections from this region will doubtless give us evidence of a greater distribution and it may be that the species occurs on both continents. Some of the Siberian forms described are impossible for me to separate from several European forms, especially from *P. suspiciosus*, on account of the meager descriptions, but this latter species can be readily separated from *P. seriatus* by the scale and hair characters, the hind tibiæ and the last abdominal segment.

Phytonomus trivittatus Say.

Phytonomus trivittatus:
1831: Say: Desc. N. American Curculionides, p. 12–13.
1859: Leconte: Comp. Writings of Thomas Say, 1: 273–4.
1873: Crotch: Cat. Coleop. N. America, p. 118, no. 6998.
1876: Leconte: Rhyncophora of N. America, p. 430, app. sp. 7 (unrecog.)
1885: Henshaw: Cat. Coleop. Am. N. of Mex., p. 137.
1909: Webster, R. L.: Entom. News, 20 : 81.

Hypera trivittata:
1880: Austin: Supp. Check List Coleop. N. Am., p. 45, no. 8889.
Phytonomus setigerus:
1876: Leconte: Rhyncophora of N. America, p. 125, no. 3, p. 415.
1885: Henshaw: Cat. Coleop. Am. N. of Mex., p. 137, no. 8229.
1889: Kilman: Canad. Entomologist, 21: 136.
1890: Wickham: Canad. Entom., 22: 171.
1903: Evans: Canad. Entom., 35: 319.
1909: Webster, R. L.: Entom. News, 20:81.
Hypera setigera:
1880: Austin: Supp. Check List Coleop. of N. Amer., p. 45, no. 8883.
Phytonomus castor:
1909: Kwiat: Entom. News, 20: 335 (nec *castor* Lec.)
1909: Titus: Journ. Ec. Entom., 2: 149.
1910: Titus: Bul. 110, Utah Agr. Exp. Sta., p. 72.

Original description: Say, 1831, p. 12:

"*P. trivittatus.* Blackish-brown with numerous scale-like hairs. Inhabits North-west Territory.

Body blackish-brown, with numerous robust hairs almost resembling scales, which are longer in three yellowish metallic thoracic vittæ of which the lateral ones are broader and terminate in a spot on the humerus; the vittæ and spot are pale brownish cinereous; antennæ rufous; elytra with large costal spots, interstitial lines obsoletely alternating with blackish and pale brown-cinereous; suture behind the middle also pale brown-cinereous; thighs beneath near the tip emarginate; anterior tibiæ a little incurved at tip.

Length one-fifth of an inch."

Adult: (Plate XXIX, figs. 1–5). Length 3.75–6.5 mm. Width 1.5–3.5 mm.

Black or dark brownish red, elongate oval, usually densely pubescent with scales and hairs. Legs black or reddish-black.

Head densely closely pubescent with long slender hairs the pubescence extending some distance down the beak, especially dense on the front which between the eyes is narrower than the width of a single eye; beak with a smooth flat carina or keel, possessing above the antennal groove a long shallow narrow impression, sides and tip of beak more or less sparsely finely punctured, with a few long slender hairs. Some of the hairs on the head above and behind the eyes are broader. *Eyes* elongate oval, without a fovea behind; *antennal groove* deep, strongly sloping towards the base of the eyes; *antennæ* rufous or reddish testaceous, scape reaching the margin of the eye, at least as long as the first six joints of the funicle, first funicular joint stout, one-half longer than the second which is distinctly longer than the third, club elongate-oval, darker and finely densely pubescent, more or less pointed at tip.

Prothorax narrowest anteriorly, strongly widely rounded near the middle, but nowhere as wide as the elytra at their base; the dorsum with a narrow light median longitudinal line bordered on each side by a much wider dark line or band, and beyond these on the edge the scales are again light, the lower part of the sides and part of the venter with dark scales; the side band of light scales extends back onto the elytra near the humeri and in one specimen partially covers it, in the others examined

the humeri are very dark. Thoracic hairs all pale, striate or ribbed thick at the base and near the tip pointed, there are narrow elongate scales and wider scales emarginate at the tip and in the wider forms the processes are more prolonged; no fringe of forward directed hairs on the anterior border beneath; prothorax polished, punctures circular, rather deep, and distinctly separated.

Map 7. Distribution of *Phytonomus trivittatus* Say, *maritimus* Titus, *pubicollis* Lec., and *castor* Lec.

Elytra about four times as long as prothorax along the dorsum, or in some specimens longer; striæ very distinct, their punctures especially so on the dorsum, in each black circular puncture there is a short stout hair; the interspaces have elongate hairs which are thickened and ribbed for two-thirds of their length and then abruptly narrowed on one side and slender to the point; scales of the elytra striate only slightly emarginate, points produced as long slender processes. All the elytral and

most of the thoracic hairs are more or less decumbent, curved backward, especially on the prothorax and near the base of the elytra. Alternate interspaces often tesselated with dark brown, especially on the sides. Hairs on interspaces white, except for an occasional black one, humeral spot very large and distinct, brownish-gray or even black or parti-colored, this spot extending back on the interspaces for a considerable distance; a dark common central basal elytral spot is present

Venter with scales of under side of thorax shorter and wider, on the abdomen some are arranged in transverse rows at the posterior margins of the segments; mesosternal process between the middle coxæ elevated, curved backward, narrowly elongate and ending in a sharp point; a short triangularly produced process from the prosternum is also evident between the front coxæ; intercoxal process of first abdominal segment rounded broadly to a point.

Legs vary from black to reddish-brown, all the femora darker than tibiæ and covered with long narrow emarginate scales, the points of which are very long and slender; crown of spines on anterior tibiæ yellow and blunt;tibiæ and tarsi hairy, first three joints extremely setose beneath with silvery hairs; front femora of the male not strongly curved.

The declivity of the elytra in this species is very evident as will be seen from the illustration, but not as great as in *P. maritinius*, where it extends quite to the tip.

Distribution: Type locality for *trivittatus;* "North-west Territory," and for *setigerus*: "Kansas." The type specimens of *setigerus* are in the Leconte coll. in Mus. Comp. Zoology, type no. 398; there are two specimens marked type.

Dominion of Canada: Manitoba: Aweme, iv–23–10 (E. Criddle).

Alberta: "Edmonton, Ont." (James White) Kilman records this specimen in 1897, I have not seen it.

British Columbia: "Ft. McLeod, N. W. Ter." (U. S. N. M.) Vancouver Id. (Wickham), recorded in 1890, specimen not seen.

United States: Illinois: Palos Park (Kwiat) vi–28–07 (coll. Wolcott, Fall, Titus, Liebeck).

Nebraska: West Point, 4–88 (U. S. N. M.).

New Mexico: Gallinas Can. (Snow) R. L. Webster *in litt.*

The Ft. McLeod record is possibly from one of the specimens reported by Evans (1903) as collected by John MacCoun in "Northwest Territory of Canada." Through Dr. Hewitt, Mr. J. D. Evans has loaned one specimen which is labeled "N. W. T. Can. J. M. 1879."

Food Plants and Life History: The Palos Park, Illinois, specimens were bred by A. Kwiat from larvæ collected on a

ground pea *Lathyrus venosus* 30 May, 1907; they spun reticulate white cocoons, one of which I have seen, and transformed to adults June 28, 1907. Mr. A. B. Wolcott tells me that he also has bred it from the same locality and that the larva is deep green in color. The cocoon is pure white and rather loosely woven.

Phytonomus maritimus new species.

Phytonomus rumicis:
1909: Webster, R. L.: Entom News, 20: 81.

Adult: (Plate XXIX, figs. 8–9). Length, 5 to 6.5 mm. Width 2 to 2.5 mm. Stouter and thicker than *trivittatus*, elytra much more declivous; reddish black, clothed with pale yellow scales and white and black hairs.

Head densely pubescent with rather stout hairs, a few notched at tip; *beak* with a smooth median *carina*, *front* between eyes narrow, an elongate, narrow, polished groove above the antennal groove; *eyes* elongate oval rather large; antennal groove deep, black, smooth; *antennæ* reddish, scope reaching margin of eyes, longer than first six funicle joints, club elongate oval, second and third joints shortest, fourth rather long pointed at tip, entire club finely pubescent with gray hairs.

Prothorax not polished, narrower in front than behind, widest in middle, shaped much as in *trivittatus* but sides are fuller and more rounded; punctures large, often confluent; dorsum of prothorax with two wide dark bands separated by a very narrow, light line, sides darker than center line; in some specimens the dorsum is entirely light. Scales broad, deeply emarginate, striate; hairs stout, white and usually notched at tip, sides parallel; scutellum very minute, covered with fine gray or white pubescence.

Elytra at base but slightly wider than prothorax, one of the Nantucket Id., specimens tessellated almost all over, the darker spots alternating along the central line; elevations between striæ, each with a single row of white hairs, each hair stout, parallel-sided and notched at tip; striæ with a fine short pointed white hair in each puncture. All the hairs semi-decumbent; scales on the elytra more elongate than on thorax, processes more slender and pointed; the dark spots are velvety black scales, rarely with a black hair on the part of the interspaces where they occur; there is a tendency on all the specimens for a black band to occur on the third interspace beginning at the base of each elytron and gradually fading out.

Venter; scales more of the shape of those on the elytra than of the thoracic scales, prosternal process short, triangularly pointed; mesosternal process between middle coxæ long, curved, pointed; intercoxal process of third abdominal (first visible) segment broad, rounded almost to the center and terminating in a short, sharp point. In the male this segment is emarginate posteriorly.

Legs; dark red, clothed in front with elongate emarginate scales, tibial crown of spines pale red or yellowish red, a distinct emarginate process on each tibia at the tip, not as prominent as in *seriatus*.

The declivity of the elytra is extremely prominent and extends quite to the tip. The scales beneath the elytra on the abdomen are sparse except for a dense fringe on each segment posteriorly.

Distribution: (See Map 7). Type: U. S. N. M., Nantucket Id.

Massachusetts: Nantucket Island (U. S. N. M., Field Col. Mus., Bolter Coll. Univ. of Ill.); Edgartown Martha's Vineyard Id. vi–27–10 Johnson (Coll. Bost. Soc. Nat. Hist.); Chatham, vii–14–07 (Coll. Frost).

The Nantucket Island specimens are, I believe, all from the same lot and were probably collected by H. Soltau. They have stood in the various collections under the name of *Phytonomus rumicis* L. They, however, do not belong to this group of the genus. One of the specimens is marked collected on vetch, and another specimen "on Vicia sativa."

Superficially the species resembles *P. murinis* Fab. more than *P. trivittatus* Say but it belongs in the group with the latter species.

Phytonomus castor Leconte.

Phytonomus castor:
1876: Leconte: Rhyncophora of N. America, p. 126, 415.
1885: Henshaw: Cat. Coleop. Am. N. of Mex., p. 137,. no. 8233.
1909: Webster, R. L.: Entom. News, 20: 81.
1910: Titus: Journ. Ec. Entom., 3: 470.

Hypera castor:
1880: Austin: Supp. Check List N. Am. Coleop., p. 45, no.

Adult: (Plate XXX, figs. 7–9). Length 5–5.5 mm. Width 1.8–1.9 mm.

Black, elongate oval, small, densely pubescent with fine gray and black scales and hairs. Legs black or reddish black.

Head covered with very fine hairs and with scales which are cleft to the base or nearly so; *front* as wide as eye, in one specimen wider, with a distinct fovea; *eyes* elongate oval, narrower below; *beak* shorter than prothorax, widened at the polished tip which is jet black, sparsely punctured, along groove above the point of antennal insertion on the dorsal carina which is very indistinct; *antennæ* inserted very near the tip, the groove deep and wide, scape polished reddish yellow, reaching almost to the eyes (in one specimen almost black), longer than the seven funicular joints, first funicle joint about one-third longer than second, which is longer than third; club pointed, finely, densely pubescent, darker than remainder of antennæ.

Prothorax longer than wide, narrowed in front, sides rounded, widest in front of middle, densely punctured, clothed with numerous brown and white hairs and with gray or grayish-black scales cleft to the base; distinctly trivittate with white in some, in others there is scarcely a trace of the lighter lines; scales on sides and venter of prothorax sometiems shorter and broader, metallic in color, but always deeply cleft.

Scutellum minute, triangular, clothed with pale scales.

Elytra one-third wider than prothorax at their widest point, back of the middle, at base scarcely one-quarter wider; humeri distinctly clothed with jet black scales; interspaces elevated, each with a more or less complete row of white or brownish-white setæ, processes of the scales more slender and elongate, causing the pubescence to lap over the striæ; where the strial punctures can be seen they contain very short pale setæ; the type specimen has beautiful pearl-gray scales intermixed with brown and black scales to form an almost completely tesselated surface; other specimens seen possess the tesselation on parts of elytra, costal edge of elytra of all specimens seen covered with paler scales.

Venter with gray or brownish gray scales and short white setæ, on the abdomen the scales are arranged in transverse rows; mesosternal process between the middle coxæ somewhat elevated, linear, apparently with a triangular point (very densely covered with scale); intercoxal process of third abdominal segment broadly truncate.

Legs with femora and coxæ black, tibiæ and tarsi dark brown or reddish brown, femora clothed in front with scales, elsewhere the legs are covered with hairs; tibial crown of spines pale.

Distribution: Type locality "Canada" 1 specimen, Mus. Comp. Zool.; also Aweme, Manitoba, 24–vi–09 (N. Criddle). All the specimens seen are males. Life history is not known. The species is very closely related to *P. trivittatus* Say and to the European *P. viciae*.

Phytonomus pubicollis Leconte.

Phytonomus pubicollis:
1876: Leconte: Rhyncophora of N. America, p. 125, no. 5, p. 415.
1885: Henshaw, Cat. Coleop. Am. N. of Mex., p. 137, no. 8232.

Hypera pubicollis:
1880: Austin: Supp. Check List Coleop. N. Am., p. 45, no. 8886.

Adult: (Plate XXIX, figs.10–12). Length 3.2–4.5 mm. Width 1.5 mm.

Black or reddish black, rather stout, clothed with fine gray or brownish gray pubescence of scales and hairs; legs black.

Head clothed with gray or yellow-brown hairs; *front* narrow, not as wide as one of the eyes; a distinct fovea between eyes on front; *eyes* oval, not prominent; *beak* two-thirds as long as prothorax, polished near the tip, sparsely punctured, a groove above the insertion of the antennæ, not carinate, projections above tip of antennal groove more evident than in any species but *scriatus; antennal* groove black, polished; *antennæ* rufous or piceous, scape reaching to the margin of the eyes, but not longer than the funicle, first funicluar joint much longer than second, or as long as second and third united, second nearly twice as long as third, the funicle joints are darker from the third on and the club is dark, densely pubescent with fine hairs, oval, pointed.

Prothorax almost quadrate, a little wider in the middle and narrowed anteriorly, never nearly as wide as elytra at base, clothed with brown, gray and white hairs and intermixed scales; the scales are deeply,

roundly emarginate, the processes long and slender, scales never cleft; thorax polished, closely densely punctured. There is an obsolete-trivittation on the thorax caused by a few pale scales in the center and on the side in longitudinal lines, the intermediate bands are of brown scales.

Elytra at base at least one-third wider than prothorax, humeri rounded with dark scales (sometimes almost black), striæ, especially the first and second, deeply punctured, interspaces elevated, a quadrate common spot at base reaching the second interspace, darker brown in color (more evident in type specimen); interspaces clothed with gray and brown scales alternating with brown and black tesselations, especially evident on the last third of the sutural space; hairs or bristles decumbent, sparse on the dorsum at the base, more numerous behind and lying closer to the scales. From the side the elytra show a distinct elevation about two-thirds of the distance towards the tip, then are rapidly obliquely slanted to the blunt tip.

Venter clothed with fine deeply emarginate scales, a depression on the first and last segments; mesosternal process between middle coxæ very narrow, linear, elevated, clothed with paler scales; intercoxal process of first segment not broad, pointed.

Legs with femora black or brownish black, tibiæ and tarsi testaceous, claws and last tarsal joint sometimes darker; posterior tibiæ with a very short crown of spines, anterior tibiæ strongly curved inward, anterior femora deeply contracted near the apex.

Distribution: (See Map 7). Type locality "Vanc. Id.", one specimen, a male, in the Leconte collection, Mus. Comp. Zoology.

I have examined one other specimen, also a male, from Vancouver Island, loaned me by Mr. H. C. Fall, Pasadena, Cal.

R. L. Webster (1909) determined a specimen from Alaska in the Lugger collection as this species. I have seen but one specimen from this collection marked Alaska and it is *P. seriatus* Mann.

Phytonomus meles Fabricius.

Curculio griseus:
1776: Muller: Zool. Dan. Prodr. Anim., p. 88 (nec. Fabricius 1775).
1790: Gmelin: Linn. Syst. Nat. ed. xiii, p. 1757, no. 204.
1827: Gyllenhal: Ins. Suecica, 4 (pt. 4 app.): 372, no. 40.

Curculio meles:
1792: Fabricius: Syst. Ent. emend., 1 (pt. 2): 466, no. 300.
1795: Fabricus: Nomen. Entomologicus, p. U.
1795: Herbst: Nat. Ins. Kafer, 6: 495.
1795: Panzer: Entom. Germanica, p. 325, no. 148.
1795: Weber: Nomen. Entom. sec. E. S. Fab., p. 56.
1796: Fabricius: Ind. Alphabeticus, E. S. Emend., p. 57.
1801: Fabricius: Syst. Eleutherat., 2: 523, no. 97.
1828: Boitard: Man.d' Entom., 1: 407.

Brachyrhinus meles:
1804: Latreille: Hist. nat. Gen. et parc., 11: 165, no. 31.

Rhynchaenus meles:
1813: Gyllenhal: Ins. Suec., 3 (pt 3): 97, no. 29 *pedestris*).
1820: Billberg: Enumerat. Ins., p. 42.
1828: Zetterstedt: Fauna Ins. Lapponica, 1: 319, no. 35.
1840: Zetterstedt: Ins. Lapponica, p. 179.

Hypera meles:
1821: Germar: Germ. & Zinck. Mag., 4: 340, no. 9.
1833: Villa: Cat. Coleop. Eur. dupl. coll. Villa, p.
1844: Villa: Cat. dei Coleop. della Lombardia, p.
1848: Walton: Ann. Mag. Nat. Hist. (2) 1: 299, no. 12.
1849: Walton: Stett. Entom. Zeit., 10: 261.
1861: Waterhouse: Cat. British Coleop., p. 71, no. 12.
1863: Lacordaire: Hist. nat. Ins. Coleop., 6: 401.
1869: Kraatz: Verz. Kafer Deutschland, p. 52.
1871: Kirsh: Berl. Ent. Zeit. 15. 189.
1871: Gemminger et Harold: Cat. Coleop., 8: 2383.
1877: Stein & Weise: Cat. Col. Eur. ed. 2, p. 143.
1874: Redtenbacher: Fauna Austriaca, Kafer, 2. 254.
1879: Taeshenberg: Die Kafer und Haubflugler, 2: 123.
1880: Koppen: Die Schaflichen Ins. Russlands, p. 209.
1880: Rupertsberger: Biol. d. Kafer Europa, p. 201.
1882: Fuast: Deut. Entom. Zeits., p. 259.
1882: Heyden: Cat. Coleop. Sibiria, p. 165 (subg. Dapalinus).
1883: Weise in H. R. & W. Cat. Col. Eur., ed. 4, p. 159.
1884: Bargagli: Bul. Ent. Soc. Ital., 16: 167.
1884: Bargagli: Rass. Biol. Kinc. Eur., p. 94.
1884: Bedel: Coleop. Bassin d. l. Seine, p. 79, 259, no. 16.
1891: Fowler: British Coleop., 5: 230, no. 235.
1891: Schneider: Coleop. & Lepidop. Bergen, p. 113, no. 37.
1891: Weise in H. R. & W.: Cat. Coleop. Europ., p. 302.
1893: Bertolini: Bul. Ent. Soc. Ital., 25: 245.
1894: Rupertsberger: Biol. d. Kafer, p. 209, 294.
1896: Heyden: Cat. Coleop. Sibiria, p. 152, (subg. Dapalinus).
1896: Martirelli: Ann. d. Hist. nat., 26: 295 (sep. p. 15).
1903: Everts: Coleop. Neerlandica, p. 603.

Phytonomus meles:
1833: Dejean: Cat. Coleop. coll. Dejean, ed. 2, p. 264.
1834: Gyllenhal in Schönherr: Gen. et sp. Curc., 2 (pt 2): 390, no. 32.
1837: Dejean: Cat. Coleop. coll. Dejean, ed. 3, p. 287.
1842: Boheman in Schönherr: Gen. et sp. Curc., 6 (pt 2): 382.
1842: Germar: Stett. Entom. Zeit., 3: 101.
1843: Schmidt: Stett. Ent. Zeit., 4: 24.
1843: Sturm. Cat. Kafer Sammlung, p. 201.
1844: (Dohrn): Cat. Coleop. Europe, p. 52.
1847: Hochhuth: Bul. Imp. Soc. Mosc. (2) 1: 493, no. 103.
1849: (Dohrn): Cat. Coleop. Europe, p. 61.
1849: Redtenbacher: Fauna Austriaca, Kafer, p. 436.
1851: Perris: Mem. Acad. Sc. Lyon, n. s., 1: .
1853: Zebe: Syn. d. bisher in Deutsch. aufgef. Coleop. p. 75.
1855: Jac. du Val: Gen. Coleop. d' Europe, p. 110.
1857: Lentz: Neus Verz. Preussichen Kafer, p. 125.
1858: Dohrn: Cat: Coleop. Eur., p. 79.
1859: Motschoulsky: Col. d. Gov. Jak. (Melang. biol. Ac. Petrop.) p.
1860: Motschoulsky: Cat. Ins. Amour, p. 9.
1862: Laboulbene: Ann. Ent. Soc. Fr., (4) 2: 569–573, pl. 13, fig. 29–33.
1862: Schaum: Cat. Coleop. Europa, ed. 2, p. 89.
1868: Capiomont: Revis. de Hyperides, p. 173–175, pl. 2, fig. 20.
1869: Giebel: Coll. Univ. Halle-Wittenberg, pp. 44, 47.
1871: Brischke: Schr. d. Naturf. Ges. in Danzig, n. f., 2 (3): 23.
1872: Bertolini: Cat. Syn. e Top. Coleop. Ital., p.
1874: Kaltenbach; Pflanzen Feinde, p. 121.

1874: Siebke: Enum. Ins. Norvegicum, 1: 266, no. 9 (miles).
1878: Schneider & Leder: Beit. kennt. Kauk. Kaferfauna, p. 287.
1881: Riley: Amer. Naturalist, 15: 912.
1882: Riley: Report of Entomologist, p. 111.
1883: Riley: in Rpt. U. S. Dept. Agric. f. 1881–2, p. 171.
1883: Lintner: First Rpt. St. Ent. N. Y., p. 248.
1891: Seidlitz: Fauna Transsylvanica, p. 677.
1901: Petri: Monog. Coleop.—Tribus Hyperini, p. 158–9, 202.
1901: Petri: Bestim. Tab. Coleop., Hft. 44, Hyperini, p. 38.
1906: Weise in H. R. & W.: Cat. Coleop. Eur., p. 65.
1909: Ferrant: Die Schlad. Ins. Land-u. Forst. pt. 2, p. 137.
1910: Kleine: Entom. Blatter, 6: 199.
1911: Titus: Psyche, 18: 74.
1911: Champlain: Psyche, 18: 173.

Curculio trifolii:
1795: Herbst: Nat. Ins. Kafer, 6: 266, tab. 80, no. 5.
1800: Paykull: Fauna Suecica, 3: 232, no. 49.

Rhynchaenus trifolii:
1813: Gyllenhal: Ins. Suec., 1 (pt 3): 111, no. 40.
1827: Gyllenhal: Ins. Suecica, 1(pt. 4, app. 3): 572, no. 40.
1834: Sahlberg: Ins. Fennica, p. 43, no. 33.

Hypera trifolii:
1821: Dejean: Cat. Coll. Coleop., p. 89.
1826: Sturm: Cat. Ins. Sammlung, 1: 157.
1829: Stephens: Sys. Cat. Brit. Ins., p. 169, no. 1726 (?trilineatus).
1831: Stephens: Entomology, 4: 100, no. 20 (?trilineatus).
1868: Villa: Relaz. Sugli Ins. che. devas. il Trifogli, p. 1.

Phytonomus trifolii:
1874: Kaltenbach: Pflanzen Feinde, p. 121.

Phytonomus meles var. *trifolii:*
1874: Kaltenbach: Pflanzen Feinde, p. 124.

Curculio borealis:
1800: Paykull: Fauna Suec., 3: 249, no. 68.

Rhynchaenus borealis:
1813: Gyllenhal: Ins. Suec., 1 (pt 3) :115, no. 43.
1828: Zetterstedt: Faun. Ins. Lapponica, 1: 321, no. 38.
1840: Zetterstedt: Ins. Lapponica, p. 181, no. 44.

Hypera borealis:
1821: Germar: Germ. & Zinck. Mag., 4: 339, no. 7.
1827: Gyllenhal: Ins. Suec. 1 (pt 4, 100. 3): 572, no. 43.
1881: Bargagli: Bul. Ent. Soc. Ital., 16: 167.

Phytonomus borealis:
1858: Matheiu: Ann. Soc. Ent. Belg., 2: 198, no. 206.

Curculio plantaginis:
1802: Marsham: Entom. Brit., 1: 267.

Hypera plantaginis:
1829: Stephens: Cat. Sys. Brit. Ins., p. 169, no. 1725.
1831: Stephens: Entomology, 4: , no. 19.

Curculio stramineus:
1802: Marsham: Entom. Brit., 1: 267, no. 88.

Rhynchaenus stramineus:
1819: Samouelle: Entom. Useful Comp., p. 369.

Hypera straminea:
1826: Curtis: Brit. Entom., 2: no. 116. 10.
1829: Stephens. Sys. Cat. Brit. Ins., p. 169, no. 1727.
1831: Stephens: Entomology, 4: 99, no. .

Hypera picipes:
1821: Dejean: Cat. Coll. Coleop., p. 89.
1833: Dejean: Cat. Coleop. coll. Dejean. Dejena, ed. 2, p. 264.
1837: Dejean: Cat. Coleop. coll. Dejean, ed. 3, p. 287.
1841: (Dohrn) Cat. Coleop. Eur., p. 52.

Hypera picipes:
1829: Stephens: Sys. Cat. Brit. Ins., p. 168, no. 1721.
1831: Stephens: Entomology, 4: 93, no. 15.

Hypera murina:
1829: Stephens: Cat. Sys. Brit. Ins., p. 168, no. 1722 (nec. Fabr.).
1831: Stephens: Entomology, 4: 93, no. 16.

Phytonomus castor:
1910: Smith: Cat. Ins. New Jersey, p. 381 (nec. Lee.).

"300. *C. brevirostris griseus thoracis dorso fusco linea albida, elytirs nigro punctatis, sutura ante apicem albida.*

"*Habitat in Germania. Dom Smidt.*

"*Paullo minor C. corvli. Caput griseum rostro cylindrico, nigro. Thorax supra grisues dorso lato, fusco linea media grisea. Flytra striata, moz grisea. mox magis ferruginea, nigro punctata sutura ante apicem linea distincta, albida. Pedes concolores.*"

Adult: (Plate XXIV, figs. 9, 15, 16; Plate XXX, figs. 4–6). Length 3.5–5 mm. Width 1.7–2.1 mm.

Black or reddish black, elongate-oval, small, sides of elytra nearly parallel; scales cleft to the base, hairs never long and erect.

Head small, finely closely regularly punctured; *front* very narrow, never as wide as the eye, densely pubescent; *beak* long slender, cylindrical, curved, in female longer than thorax; distinct central keel terminating opposite the antennal insertion in a wider smooth portion which possesses an elongate depression, one or more rather regular punctured striæ on the sides; tip reddish, smooth, polished sparsely punctured and with a few long hairs; *eyes* elongate oval, large; *antennæ* yellowish red or red, inserted near apex of beak, scape reaches margin of the eyes, first funicle joint twice as long as second, following except third shorter than broad, seventh very broad, club oval, pointed, densely pubescent.

Prothorax very wide, sometimes one-fourth wider than long, widest about the middle, sides strongly widely rounded, anterior margin narrower than posterior, dorsum almost flat, densely punctured, but punctures distinctly separated by smooth shining part of prothorax; usually rather sparsely covered with metallic gray or pale brown scales, a long central paler line may be generally distinguished, and the sides are uniformly paler, the bands between are often irregular in width.

Scutellum paler, small distinct, narrowly triangulate.

Elytra at base scarcely wider than prothorax in widest part, nearly rectangular, very slightly rounded at sides, humeri rounded somewhat prominent; finely striately punctate, interspaces a very little elevated, scales rather uniform in color over the elytra, but in some specimens the elytra are almost entirely tesselated with dark brown on a paler brown background; sutural scale often darker than others especially in front; all the scales sometimes metallic green or gray or brown gray or even

dark brown. Hairs black, dark brown or white placed on interspaces, curved, directed backward, never erect, not placed in regular rows on the interspaces.

Venter not so densely scaled, gray or pale brown, terminal abdominal segment with long gray hairs; third abdominal segment of the male with a shallow impression near the center; intercoxal process of third segment truncately broad but ending in a short triangular point, the segment closely deeply punctured, more so than in any other species studied; mesosternal process between the middle coxæ elevated, narrowly triangular.

Legs short, femora stout, thickened; fore tibiæ of male curved inward, femora scaled in front, remainder of legs hairy, femora darker than tibiæ and tarsi but not black, remainder of legs reddish yellow to nearly black, tarsi usually a little paler.

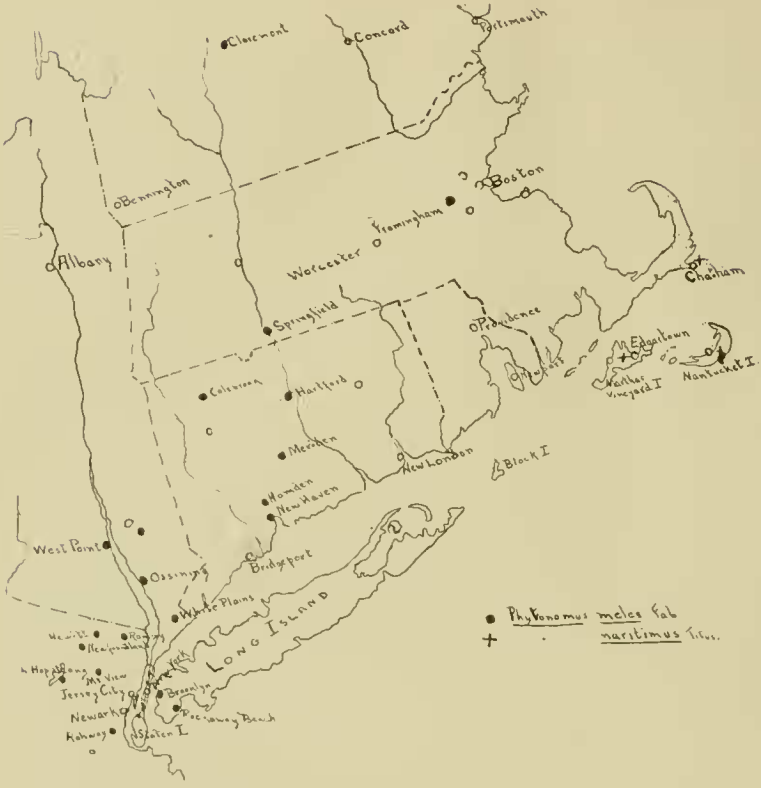
Egg: White or very pale yellow when first laid, oval, sculptured with fine hexagonal depressions. Length 0.40 to 0.45 mm., width 0.25 to 0.30 mm.

Larva: (Laboulbene 1862, and Brischke 1871): These authors state that the larvæ are deep green, first thoracic segment yellow, a long whitish-yellow median stripe interrupted on the posterior edge of each segment, another paler line below the black spiracles. Head yellow beneath, dark in front, anterior border almost straight, sides rounded, labrum emarginate with eight short stout hairs, mandibles tridentate, brownish, black at tips; prothoracic segment with an rectangular brown or blackish band across it, interrupted in the middle, the other two segments lack this band (as is usual in the other species examined); color of abdominal segments varying from yellow to clear green or dirty yellow, the median line is wide and evident. The first thoracic segment has three rows of fine brownish tubercles (Brischke) the other segment with two tubercles on the front part and six pairs in the second row; the anal segment without tubercles. All the tubercles possess hairs which Laboulbene states are on the tubercles of the dorsum short, stout and clavate at tips; tenth, eleventh and twelfth have longer hairs, not clavate. The second series of enlargements have on the thorax each three hairs.

The description of Laboulbene is long and very complete, but I have quoted here only the essential parts since he states that he had the larvæ of a variety "*Phytonomus meles* var. *trifolii*" and that it is different from the larvæ of *meles*. Personally I believe the variety is only a form that may occur in any generation but it will probably be better to leave a full description of this species until we can secure larvæ in America for the purpose.

Cocoon: According to Laboulbene the cocoon is ovoid or oval, white or amber color and remarkable for its reticulations.

Pupa: Laboulbene only states that there is nothing in particular to describe.



Map 8. Distribution of *Phytonomus meles* Fab., and *P. maritimus* Titus.

Distribution: Type locality of the Fabrician species was Germany. The species was described from Denmark, by Miller as *C. griseus*.

Capiomont and Petri give its distribution as over all Europe, except Spain and Portugal, and occurring in parts of Siberia and Transkaukasus and along the north coast of Africa.

In the United States I have examined specimens from the following places: New Hampshire; Claremont (R. P. Dow); Massachusetts; Framingham (Frost); Springfield, June 1911 (Titus).

New York: Albany, 9 July, '08 (E. P. Felt); West Point, 28 April, '08, W. Robinson (A. M. N. H.); Westchester County, (Schaeffer); Brooklyn (Schaeffer); Rockaway Beach (Bischoff).

Connecticut: Hamden, 16 May, 1910, A. B. Champlain (U. S. N. M.); New Haven, 28 May, 1910, A. B. Champlain

(coll. Conn. Agr. Exp. Sta.); Meriden (Britton in litt. May 29, 1911); Colebrook, June, 1911 (Titus); Hartford, June, 1911 (Titus).

New Jersey: Ramsey, 31 May, 1908 (Schaeffer); Hewit (Schaeffer); Rahway, 23 July (Bischoff); Newfoundland, 30 May (Bischoff); Lake Hopatcong, 30 May (J. A. Grossbeck). Also Mt. View (Bischoff *in litt*).

Mr. E. A. Bischoff writes me that this is the species listed as *Phytonomus castor* in the Smith Cat. Ins. of New Jersey. He states further, "Mr. Dow from New York was the first to collect it at Rockaway Beach and had it identified as *castor*. He was kind enough to let me have a pair; Mr. Grossbeck of New Brunswick collected it at L. Hopatcong and let me have another pair, after which I collected it at Mountain View, Newfoundland, and Rahway, N. J."

Mr. R. P. Dow (in litt. 16 May, 1911) states that he first collected this species in June, 1907, in the "Rockaway Washup." In 1908, he collected specimens in a back lot in Brooklyn and received specimens from Torre Bueno collected in White Plains. Mr. Dow states that he took the same species in Claremont, N. H., "June 23–29, 1909–10."

Food Plants and *Life History:* Gyllenhal and Germar both report the species as feeding on clover in Europe, and Herbst certainly must have taken his *trifolii* from clover. Kaltenbach (1874) notes that it feeds on young shoots of lucern; Brischke reported it as feeding on lucern in Germany, and Laboulbene took it from *Trifolium pratense* in France.

Kleine gives the food plants as *Medicago sativa*, *M. falcata*, *M. lupulina*, *M. media*, *Trifolium pratense* and *T. incarnatum*. It has been reported as causing injury in Germany, Austria and Southeast Russia to lucern.

Dr. E. P. Felt bred his specimens at Albany, N. Y., from red clover.

Dr. Britton very kindly sent me living specimens collected by Mr. Champlain at New Haven, in May. From these I secured eggs. The eggs were deposited on and in the stems and leaf petioles of clover and alfalfa and on blossoms of clover. Five to nine in a place in the stems and singly in the other situations.

Phytonomus nigrirostris Fabricius.

Curculio nigrirostris:

1775: Fabricius: System Entomol., p. 132, no. 24.
1781: Fabricius: Species Insectorum, 1: 167, no. 33.
1783: Herbst: Fuesels Archiv., 4: 69, no. 8, T. 24, fig. 3.
1787: Fabricius: Mantissa Insect., p. 100, no. 44.
1789: de Villers: Entom. Fauna. Suec., 1: 187, no. 43; 4: 267, no. 43.
1790: Brahm: Insektenkalendare, p. lxvii, 78, no. 250.
1790: Gmelin: Linn. Syst. Nat., ed. xiii, p. 1744, no. 105.
1790: Olivier: Hist. Nat. Ins., 5: 483, no. 55, T. 33, fig. 508, p. 140.
1790: Rossi: Fauna Etrusca, 1: 114, no. 292.
1792: Fabricius: Entom. Syst., 1 (pt 2): 407, no. 56.
1792: Paykull: Monog. Curculionidum, p. 56, no. liii.
1794: Herbst: Fues. Archiv (Fr. ed.) p. 119, no. 5, pl. 24, fig. 3a.
1795: Fabricius: Nomen. Entom., p. T.
1795: Herbst: Nat. Ins. Kafer, 6: 281, no. 254.
1795: Panzer: Entom. German., p. 302, no. 19.
1795: Panzer: Fauna Germ., p. 36, no. 14.
1795: Rossi: Fauna Etrusca, (Hellwig ed.), 1: 121, no. 292.
1795: Weber: Nomen. Entomol. sec. E. S. Fab., p. 53.
1796: Fabricius: Ind. Alphab., E. S. emend., p. 58.
1797: Bergstrasser: Epit. Ent. Fab. Nomen., p. 67.
1800: Paykull: Fauna Succica, Ins., 3: 247.
1801: Trost: Kleine Beyt. Entom., p. 39, 428.
1802: Marsham: Entom. Brit., 1: 267, no. 89.
1804: Latreille: Hist. nat. Crust. et Ins., 11: 131, no. 19.
1819: Samouelle: Entom. Useful Comp., p. 205.
1855: Nordlinger: Die Kleinen Feinde d. Landw., p. 152.

Rhynchaenus nigrirostris:

1801: Fabricius: Syst. Eleuth., 2: 448, no. 53.
1802: Fabricius: Ind. G. et sp. Sys. Eleuth., p. 69, no. 448, 53.
1805: Illiger: Mag. f. Insektenkunde, 4: 141, no. 53.
1807: Olivier: Hist. Nat. Ins., 5: 140, no. 98, pl. 33, fig. 508.
1813: Gyllenhal: Ins. Suec., 1 (pt 3): 114, no. 42.
1813: Panzer: Ind. Ent. Fauna Germ., p. 190, no. 7.
1817: von Beck: Beit. z. baiersch. Insektenf., p. 41, no. 73.
1819: Samouelle: Entom. Useful Comp., p. 369.
1820: Billberg: Enum. Insectorum, p. 42.
1827: Gyllenhal: Ins. Suec. 1: (pt 4, app. 3): 572, no. 42.
1828: Boitard: Man. d'Entom., p. 422.

Hypera nigrirostris:

1817: Germar: Germ. & Zincker Mag. 2: 340.
1819: Samouelle: Entom. Useful Comp., p. 205.
1821: Germar: Mag., 4: 338, no. 5.
1821: Dejean: Cat. coll. Coleop., p. 88.
1826: Curtis: Brit. Entom., 2: no. 116, 19.
1826: Sturm: Cat. Ins. Sammlung, 1: 157.
1829: Curtis: Guide Arr. Brit. Ins., p. 50, no. 21.
1829: Stephens: Sys. Cat. Brit. Ins. p. 169, no. 1723.
1831: Stephens: Entom., 4: 98, no. 17.
1834: Sahlberg: Ins. Fennica, 2: 45, no. 35.
1848: Walton: Ann. Mag. Nat. Hist. (2) 1: 297, no. 9.
1849: Walton: Stett. Entom. Zeit., p. 261.
1861: Waterhouse: Cat. Brit. Coleop. p. 71, no. 9.
1863: Lacordaire: Hist. Nat. Ins. Coleop., 6: 401.
1869: Giebel: Verz. z. Mus. Univ. Halle-Wittenberg, p. 45, no. 52.
1869: Kraatz: Verz. Kafer Deutsch., p. 52.
1871: Kirsch: Berl. Ent. Zeit., 15: 191.
1871: Gemminger & Harold: Cat. Coleop. 8: 2384.
1871: Brischke: Schrf. d. Naturf. Ges. Danzig, n. f., 2 (pt 3): 24.

1873: Bargagli: Bul. Ent. Soc. Ital., 5: 96.
1874: Redtenbacher: Fauna Austriaca, Kafer, 2: 255.
1877: Stein & Weise: Cat. Col. Eur., ed. 2, p. 143.
1877: Piccioli: Bul. Ent. Soc. Ital. 9: 228, no. 143.
1879: Taschenberg: Die Kafer u. Haubflugler, 2: 124.
1880: Austin: Supp. Check List Coleop. N. Am., p. 45, no. 8887.
1880: Koppen: Die Schadl. Ins. Russlands, p. 209.
1882: Piccioli & Cavanna: Bul. Ent. Soc. Ital., 14: 379, no. 58.
1883: Bargagli: Bul. Ent. Soc. Ital., 15: 321.
1883: Weise in H. R. & W. Cat. Col. Eur., ed. 4, p. 159.
1880: Rupertsberger: Die Biol. Kafer Eur., p. 210.
1884: Bargagli: Bul. Ent. Soc. Ital., 16: 168.
1884: Bargagli: Rass. Biol. Rinc. Europei, p. 95.
Bedel: Coleop. Bassin d. l. Seine, pp. 79, 260, no. 20.
1889: Fauvel: Revue Entom. 8: 157, no. 460.
1891: Schneider: Coleop. & Lepidop. Bergen, p. 113, no. 36.
1891: Weise in H. R. & W.: Cat. Coleop. Eur., p. 304.
1893: Bertolini: Bul. Ent. Soc. Ital., 25: 245, no. 19.
1897: Kemipers: Tijd. v. Entom., 40: 177.
1903: Everts: Coleop. Neerlandica, p. 604.
1907: Wachsmann: Rovar. Lapok, 14: 19.

Phytonomus nigrirostris:

1833: Dejean: Cat. Coleop. coll. Dejean, ed. 2, p. 264.
1834: Gyllenhal in Schonheer: Gen. et sp. Curc., 2 (pt 2): 393, no. 37.
1837: Dejean: Cat. Coleop. coll. Dejean, ed. 3, p. 286.
1842: Schonherr: Gen et sp. Curc., 6 (pt 2): 384, no. 86.
1843: Sturm: Cat. Kafer Sammlung, p. 201.
1844: (Dohrn): Cat. Coleop. Eur., p. 52.
1847: Hochhuth: Enum. Russelkafer Kauk. et Transk., p. 494, no. 107.
1849: (Dohrn): Cat. Col. Eur., p. 61.
1849: Gaubil: Cat. Syn. Col. Eur. et Alg., p. 156, no. 63.
1849: Lucas: Exp. Sc. d'Alg., Ins., 2:425, no. 1133.
1849: Redtenbacher: Fauna Austriaca, Die Kafer, p. 433, 437.
1853: Murray: Cat. Col. Scotland.
1853: Zebe: Syn. d. bisher in Deutsch. aufgef. Coleop., p. 75.
1855: Jac. du Val: Gen. Coleop. Europe, p. 110 (in part).
1857: Lentz: Neue verz. d. Preuss. Kafer, p. 125.
1858: Dohrn: Cat. Col. Europe., p. 79.
1858: Matheiu: Ann. Ent. Soc. Belg., 2: 198, no. 205.
1858: Tyrer: Ent. Weekly Intell., 1 (no. 4) p. 6.
1859: Belke: Bul. Soc. Imp. Mosc., p. 53.
1862: Schaum: Cat. Coleop. Europ., ed. 2, p. 89.
1865: Thomson: Skand. Coleop., 7: 173, no. 15.
1866: de Marseul: Cat. Coleop. Eur. et. conf., p. 100, no. 79.
1868: Capiomont: Rev. d. Hyperides, p. 227, T. 1, fig. 5.
1873: Girard: Traite Elem. d'Entom., 1: 670.
1874: Siebke: Enum. Ins. Norvegicum, fasc. 1, p. 266.
1874: Kaltenbach: Pflanzen Feinde, p. 124.
1875: Bargagli: Bul. Ent. Soc. Ital., 6: 261 (as *nigrocornis*).
1876: Everts: Tijd. v. Entom., 20: xxviii.
1876: Leconte: Rhyncophora of N. America, p. 126.
1877: Heyden: Jahrb. Nassau. Verein, 29: 313.
1878: Dimmock: Psyche: 2: 164 (Bibliog. record).
1877: Provancher: Le Naturaliste Canad., 9: 324.
1878: Hubbard & Schwarz; Proc. Am. Phil. Soc. 17: 663.
1879: Veth: Tijd. v. Entom., 22: 95.
1881: Riley: American Naturalist, 15: 912.
1882: Riley: Report of Entomologist, p. 111.
1883: Riley: in Rpt. U. S. Dept. Agric. f. 1881–2, p. 171.
1883: Lintner: First Rpt. St. Entom. N.Y., p. 248.
1883: Brodie & White: Check List Ins. Dom. Canada, p. 47.

1884: Fletcher: Canad. Entomologist, 16: 215.
1884: Harrington: Canad. Entomologist, 16: 217.
1885: Henshaw: Cat. Coleop. Am. N. of Mex., p. 137, no. 8234.
1885: Riley: Proc. Ent. Soc. Washington, 1: 20.
1889: Hamilton: Trans. Am. Ent. Soc., 16: 155, no. 456.
1889: Heyden: Ver. Nat. Nassau., 42: 147.
1889: Vitale: Bul. Ent. Soc. Ital., 21: 150.
1890: Smith: Cat. Ins. N. Jersey, p. 250.
1890: Fletcher: 21st Rpt. Ent. Soc. Ont., p. 41.
1894: Hanham: Canad. Entom., 26: 352.
1895: Harrington: 26th Rpt. Ent. Soc. Ont., p. 49–51.
1899: Fernald: 11th Rpt. Hatch Exp. Sta. (Mass.), p. 103.
1899: Smith: Cat. Ins. New Jersey, p. 343.
1900: Harrington: 30th Rpt. Ent. Soc. Ont., p. 94–96.
1900: Fletcher: Bul. 26 n. s. Div. Ent., U. S. Dept. Agr., p. 96.
1900: Fletcher: 30th Rpt. Ent. Soc. Ont., p. 96.
1901: Petri: Monog. Coleop.–Tribus Hyperini, pp. 164, 203.
1901: Petri: Bestim. Tab. Coleop. Hft. 44, Hyperini, pp. 27, 38.
1902: Felt: 17th Rpt St. Ent. N. Y., p. 845.
1906: Fletcher: 36th Rpt. Ent. Soc. Ont., p. 84.
1906: Weise in H. R. & W.: Cat. Coleop. Eur., p. 656, ed. 2.
1907: Close: 16–18th Rpts. Del. Agr. Exp. Sta., p. 106.
1907: Pierce: Ann. Rpt. Neb. St. Bd. Agric., p. 259.
1907: Schwarz: Proc. Ent. Soc. Wash., 9: 114.
1907: Wachsmann: Rovar. Lapok, 14: 19.
1908: Houghton: Journ. Econ. Ent., 1: 297.
1909: Ferrant: Die Schad. Ins. d. Land-u. Forstw. p. 137, fig. 82.
1909: Webster, R. L.: Entom. News, 20: 81.
1909: Webster, F. M.: Bul. 85, Bur. Ent., U. S. Dept. Agr., pp. 1–12, figs. 8.
1909: Bur. Entom.: Yearbook U. S. Dept. Agric., p. 569.
1910: Schwarz: Proc. Ent. Soc. Wash., 12: 71.
1910: Titus: Journ. Ec. Entom., 3:461.
1910: Hooker: Exp. Sta. Record, p. 256.
1910: Kleine: Entom. Blatter, 6: 199.
1910: Smith: Cat. Ins. New Jersey, p. 381.
1911: Webster: Bul. 85 (rev. ed.) Bur. Ent. U. S. D. Agr., pp. 12, figs. 8.
1911: Gibson: 41st Rpt. Ent. Soc. Ont., p. 12.

Curculio variabilis:
1781: Fabricius: Spec. Insect., 1: 67, no. 34.
1787: Fabricius: Mant. Ins., p. 100, no. 45.
1789: Villers: Entom. Fauna Suec., 1: 187, no. 45; 4: 267, no. 45.
1790: Gmelin: Linn. Syst. Nat. ed. xiii, p. 1744, no. 105.
1790: Olivier: Hist. Nat. Ins., 5: 483, no. 56.
1792: Fabricius: Ent. Syst., 1 (pt 2): 407, no. 57.
1795: Fabricius: Nomen. Entom., p. T.
1795: Panzer: Entom. German., p. 302, no. 20.
1796: Fabricius: Ind. Alphab. E. S. emend., p. 58.
1797: Bergstrasser: Epit. Ent. Fab. Nomen., p. 67.

Curculio nigrirostris var. *variabilis:*
1792: Paykull: Monog. Curc., p. 56, liii.
1795: Herbst: Nat. Ins. Kafer, 6: 281, no. 254, var. 4.
1855: Nordlinger: Die Kleiner Feinde Landw., p. 153.

Rhynchaenus variabilis:
1801: Fabricius: Syst. Eleuth., 2: 448, no. 54.
1802: Fabricius: Ind. G. et sp. Syst. Eleuth., p. 69.
1805: Illiger: Mag. f. Insektenkunde, 4: 141, no. 54.
1817: v. Beck: Beit. z. Baiersch. Insektenfauna, p. 42, no. 74.
1822: Illiger: Mag. f. Insektenkunde, ed. 2, 4: 141, no. 54.

Rhynchænus nigrirostris var. *variabilis:*
1813: Gyllenhal: Ins. Suecica, 1 (pt 3): 115, no. 42, var. d.
1828: Boitard: Man. d' Entom., 1: 422.

Phytonomus nigrirostris var. *variabilis:*
1858: Matheiu: Ann. Ent. Soc. Belg., 2: 198, no. 205, var.
1901: Petri: Monog. d. Coleop.—Tribus Hyperini, p. 202.
1901: Petri: Bestim.—Tab. Coleop., Hft. 44, Hyperini, p. 39.

Curculio virescens:
1790: Quensel: Diss. ign. Insect., p. 16.

Curculio fulvipes:
1801: Turton: Gen. Sys. Nat., 2: 215 (syn. by Stephens).
1802: Stewart: Elem. Nat. Hist., 2: 54 (syn. by Stephens).

Phytonomus steirlini:
1868: Capiomont: Rev. d. Hyperides, p. 223.

Hypera steirlini: Gemminger & Harold: Cat. Coleop. 8: 2387.
1871: Gemminger & Harold: Cat. Coleop., 8: 2387.
1871: Kirsch: Berl. Ent. Zeit., 15: 191.

Hypera nigrirostris var. *steirlini:*
1891: Weise in H. R. & W.: Cat. Coleop. Eur., p. 303.

Phytonomus nigrirostris var. *steirlini:*
1901: Petri: Monogr. Coleop. Tribus Hyperini, p. 202.
1901: Petri: Bestim.-Tab. Coleop. Hft. 44, Hyperini, p. 37.
1906: Weise in H. R. & W.: Cat. Coleop. Eur., p. 656.

Erirhinus viridis:
1877: Provancher: Petite Fauna ent. Can., 1: 518.

Phytonomus nigrirostris var. *hirtus:*
1901: Petri: Monogr. Coleop. Tribus Hyperini, p. 165, 202.
1901: Petri: Bestim.-Tab. Coleop. Hft. 44, Hyperini, p. 37.
1906: Weise in H. R. & W.: Cat. Coleop. Eur., p. 656.

Original description: Fabricius, 1775, p. 132, as *Curculio nigrirostris.*

"*nigrirostris. 24. C. longirostris, viridis, rostro atro.*

Habitat in Anglia. D. Banks.

Caput fuscum, rostro cylindrico, atro, nilido. Thorax gibbus, rotundatus, viridis, lineis duabus dorsalibus, fuscis. Elytra tomentosa, viridis, immaculata. Pedes fusci, femoribus simplicibus."

Adult: (Plate XXX, fig. 1). Length 3.5–4.5 mm. Width 1.3–1.7 mm. Yellowish-red to black, elongate-oval or elongate; scales cleft to the base, metallic gray-green, yellowish, gray-brown, green, deep green or blue green, apparently depending upon the maturity of the specimen.

Head densely black, small, closely finely punctured, clothed with fine pale hairs; *front* narrower than eyes; *beak* as long as prothorax or longer (in female especially so), curved, cylindrical, polished, with a median dorsal keel the whole length, interrupted above the antennal insertion by an elongate narrow depression; *eyes* much elongated, narrowed below, an indistinct fovea on the front between the eyes; *antennal groove* narrow, black, punctured; *antennæ* red or yellowish-red, scape reaching almost to middle of eye, first funicle joint not twice as long as second, joints three to seven becoming regularly shorter and broader, seventh broadly oval, club not elongate-oval, dark, densely pubescent, the remainder of the antennæ with many fine white hairs.

Prothorax one-third longer than wide, coarsely punctured, pubescent, the narrow anterior margin polished, sides almost parallel a little widened one-third of distance from anterior margin, posterior edge wider than anterior; clothed with scales deeply cleft, hairs sparse, more on anterior edge and on sides; each puncture on the sides has a scale set in

it; dorsum often with a median longitudinal pale green line bounded by rich darker bands of scales that reach to edge, the sides paler.

Elytra elongate-oval, at base slightly rounded, sides nearly parallel, humeri prominent and usually darker; striæ distinctly punctate; interspaces somewhat elevated posteriorly; scales may be uniformly of one color, or the alternate interspaces with scales of different shades of the same color or of different colors, or the elytra spotted with more or less indistinct gray or brown maculæ on a green or gray-brown background, especially along the suture; edges often with pale or reddish-brown scales on the last or last two interspaces, at the apex this coloration extends forward for some distance on each side of the suture; hairs or bristles white or black, varying in length, at base, but uniformly longer behind and usually more erect. There appears to be a tendency in this as in other species having both black and white hairs to have the colors alternating on the interspaces but this is not a fixed rule. Some specimens have a blue green longitudinal stripe on the seventh and eighth, or seventh to ninth interspaces.

Venter on the thoracic portions coarsely punctured, abdominal segments with the punctures finer; intercoxal process of first abdominal segment nearly triangular; mesosternal process angularly elevated between the middle coxæ, narrowly triangular, never linear or parallel sided, last abdominal segment longer than two previous ones, in the male with an impression on the disk.

Legs varying in color, even in matured specimens from red or reddish brown to very dark red or more rarely black; clothed with fine pale or silvery hairs sparsely set, never with scales, except on coxæ; femora stout, anterior tibiæ of male strongly curved with the apical process distinct, claws and upper side of tarsal joints often darker, pads of tarsal joints silvery-white.

Egg: Ovoid pale-greenish, surface distinctly sculptured, not as hexagonal in specimens examined as in *Hyp. punctata* eggs. The eggs darken as incubation progresses and become almost jet black, and shining. "Length, 0.55 mm. to 0.63 mm.; width, 0.35 mm. to 0.36 mm." according to Hyslop and Webster in Bul. 85, 1909. I have not had enough specimens to care to furnish data as to length at the present time, since mine seems to vary more than that given above.

Larvæ: early stages: "The newly hatched larva is 1.25 mm. in length and 0.25 mm. broad. Color white, with pinkish tinge, best seen on ventral surface. Head large with the cervical shield pale brown, the latter divided by a broad median white line, the inverted V-shaped mark on head also white; body with sparsely placed setæ longer and more conspicuous on the anal segments. In a short time the pink tinge disappears, the head becomes black, and the inverted V-shaped line extends across the now black thoracic shield, and along the entire length of the body it is produced in a very delicate, pale median dorsal line. (Described by Wildermuth and Webster)." From Bul. 85, Webster, 1909.

Later stages: "The full grown larva. (Plate XXIV, figs. 26,28, 31). The full grown larva is of a greenish straw color. The inverted white

line is still quite visible on the head. Head light brown. The cervical shield has lost its color, but the faint dorsal white line is still noticeable throughout the whole length of the body. The setæ are still prominent, there being four long ones on each segment, those on the last two segments being very long. (Description by Wildermuth and Webster)." From Webster, Bul. 85, 1909.

Cocoon: (Plate XXX, fig. 3). Constructed of very fine white threads intermixed with coarser threads, more nearly globular than cocoon of *P. posticus*. Meshes rather irregular and open, not finely, closely, evenly arranged.

Pupa: (Plate XXX, fig. 2). "Pupa distinctly resembling the adult. Abdomen almost colorless, with a slight tinge of yellow. Head, thorax and appendages increasing in density of black from time of pupation until emergence. A very distinct white line passes through center of dorsal surface of thorax and head, and continues on through the beak where it reaches its greatest width. (Description by Wildermuth)." From Webster, Bul. 85, 1909.

Map 9. Distribution of *Phytonomus nigrirostris* Fab.

Prof. F. M. Webster, of the Bureau of Entomology, very kindly loaned me specimens of the larvæ and pupæ, but the alcoholic specimens are somewhat shrunken and I do not care to attempt a full description of them, hence I have quoted from his bulletin. The tubercles on the larvæ are very distinct and in two rows on most of the segment as in other species, but there are certainly more than four on some of the segments. In the pupa the hairs on the prothorax are rather long, the first four pairs near the margin and equidistant from each other, on the posterior portion are at least three pairs of hairs and two pairs on the dorsum, this would leave one pair missing, the pupæ examined were however alcoholic specimens and may have been rubbed. It is probable that with a sufficient number to study the anal segments would show characters that might be used in separating the species.

Distribution: Type locality "Anglia. D. Banks," Fabricius, 1775. In 1781 Fabricius again described this species, under the name *variabilis* from specimens from "Hamburg. Dom. Schulz." In 1783 Herbst had specimens from Berlin.

Petri and Capiomont record it as occurring over all Europe, British Isles, Egypt, Asia Minor, Caucasus and Transkaukasus, and Algeria. It is mentioned in Hochhuth's "Russland" list but has apparently not been recorded from Siberia. The first published record from America is in Leconte's Rhyncophora in 1876, where he states that it occurs in "Massachusetts and Canada." I have a specimen from Mr. Frederick Blanchard, taken on Mt. Washington, in New Hampshire, in 1874, so that it had doubtless been here for many years previous to that time. Hubbard and Schwarz collected it in eastern Massachusetts in 1873–4. Provancher in 1877 under the name *Erirhinus viridis* described it from Quebec. Since that decade it has been gradually spreading westward and southward. Being a small, rather inconspicuous species it is easily overlooked.

I have seen many specimens from various places and have records of many others which are here included.

Dominion of Canada: New Brunswick (Fletcher, 1884) at Dalhousie.

Prince Edwards Island: Charlottetown (U. S. N. M.).

Ontario: Ottawa (Harrington, 1884); also specimens in coll. Cornell Univ.; Toronto, Nov. (Wickham coll.); 25–5–96, 97, 24–5–97 (Cornell Univ.)

Quebec: Provancher record 1877. Fletcher in 1884 reported a cocoon at "Brome in Eastern Township."

"Can." 1 specimen in U. S. N. M. marked "1874, det. Lec."

United States: Maine: Lewiston, S. Stebbins (Bos. Soc. Nat. Hist.); Monmouth 12–Aug. '03, Wales vi–15 (Frost coll.) "Maine" (Fall coll.)

New Hampshire: Mt. Washington, 1874, (Blanchard coll.); Manchester, 13 July (Wickham coll.); E. Wakefield vi–17 (Hub. & Schwarz, U. S. N. M.); "N. H." (Fall coll.)

Vermont: Bennington Co. (Cornell Univ.)

Massachusetts: "Mass." (Fall coll.); E. Mass. (Hub. & Schwarz); "Mass. 1876" (Leconte coll. M. C. Z.); Amherst 1899 (Fernald rec.); Cambridge, 1873, Henshaw (B. S. Nat. Hist.); Lowell (Wells coll. Field Col. Mus.); Mansfield 5–3, Lynn 19–3 (Hub. & Schwarz, U. S. N. M.); Melrose Hds. Clemons, 23–iv (U. S. N. M.); Concord, Tolman (Wenzel coll.); Wellesley 11 July, Sharon 20 July (Wickham coll.); Lenox (A. M. N. H.); Grafton (Sherriff coll.); Lynn 19–31 (Leconte coll. M. C. Z.); Forest Hills, 14 January 1911 (Titus); Framingham v–15–07, 5–5–09, iv–17–10, vii–20–07, 30–May–05, vii–4–07, May–08, v–8–09, Natick iv–10–09 (Frost coll.); Nantucket Id (Bolter coll.)

Rhode Island: Providence July (Frost coll.)

Connecticut: S. Woodstock, 1888 (Chittenden record). Colebrook (Titus) Jc., 1911. Britton (*in litt.* 1911): New Haven, 13 April 1898, 1 June, 1898, 26 June, 1899, W. E. B., 28 June, 1904, E. J. S. Moore, 6 July, 1904, H. L. V., 8 June 1904, W. E. B., 14 June 1909, B. H. W., 21 April, 1911, A. B. C.; West Haven, 27 June, 1905, H. L. V.; Chapinville 26 May, 1904, W. E. B.; Hamlen, 12 May, 1910.

New York: Felt (*in litt.* 1911) states distributed over entire state, and gives following as localities represented in their collections: Albany, Cortland, Denmark, Deer Park, E. Greenbush, Karner, Ithaca, Moshulu, Nassau, Newport, Oswego, Ossining, Poughkeepsie. Peekskill (Cornell Univ.); Peekskill June 98 (Van Dyke); Stony Id. 8–July–96; West Pt. 10–April, 28–April–08, 22–April–08, Babylon 4–June–93 (A. M. N. H.); Potsdam (in many coll. prob. recd. from Houghton); Coney Id. 1891 (Chittenden record); Chittenden (in Webster loc. cit.) says that it did not occur at Ithaca in 1884.

New Jersey: Smith in 1910 list says distributed well over the state. Westville 1–28, 2–25 (Wenzel); Ft. Lee (A. M. N. H.) New Brunswick vi–28, vii–6, Red Bank 5–1, 4–20, Sea Isle City 5–24, 7–4, 7–12, Madison 17–April–98, Atco 6–1, Riverton 5–1, Jamesburg 7–4 (J. B. Smith).

Pennsylvania: Mt. Airy (J. B. Smith coll.); Phila. 11–28–05 (Am. Ent. Soc.); 21–Nov.–08, Hyslop at Marion (Webster 1. c.)

Maryland: Somerset Hts., 1905 (Titus); Plummers Island; Weverton, 20 May '08, C. N. Ainslie (Webster 1. c.); Arundel (Schwarz).

District Columbia: Chevy Chase Circle 6–June–08, Caudell & Ainslie (Webster 1. c.); Washington, common (Webster).

Virginia: Fortress Monroe (Schwarz).

Michigan: Detroit (Schwarz) about 1875.

Indiana: Vigo Co. (Blatchley *in litt.*)

Minnesota: reported by Schwarz (Webster 1. c.)

Food Plants and *Life History:* Gyllenhal (1813) recorded it from "*Ononis arvenisi*". Germar (1821) mentions that the species lives on Dianthus and "in Europæ graminosis." Samouelle (1819) says it occurs in April and May in moist places on banks of ponds. Brischke in 1871 reports it as feeding in north Germany on lucerne and as occurring on "Carex filiformis". 1858 Matheiu had said it injured clover and occurred on *T. agraricum*, Bargagli (1884) gave a short account of its feeding habits on *Trifolium pratense* and notes its occurrence on various Ononis especially *spinosa*, and in the heads of *Buphthalmum salicifolium*. Kaltenbach (1874) reports Hoffman's observations on its habit of feeding in the flowers of *Buphthalmum salicifolium*, the cocoon being spun in the chaff scales, and states also that it feeds in the flower heads of *Trifolium pratense*. Ferrant (1909) gives it as one of the three injurious Phytonomus to lucern in Luxemburg. Kleine in 1910 gives no other food-plants.

The best accounts of the life history have been written by Houghton (1908) and Webster (1909), but there are many points still unknown. In America Fletcher first reported the species from clover as injurious at Dalhousie N. B., in 1884, Harrington the same year reported it as occurring at Ottawa in numbers but not injurious. The eggs are laid in early spring (March, April and May) the period probably extending over about six weeks. They are generally deposited inside the leaf sheath

next to the inner epidermis (Webster), only a few in a place. In captivity they may lay eggs in the leaves, petioles, stems, and even on the leaves. The eggs hatch in seven to eight days, the larvæ feeding in the flower buds and heads. The larval period varies from seventeen to twenty days, "the larva molts twice, the first instar occupying three to seven days, the second six to seven days and the third about seven days" (Webster l. c.) The pupal stage is about six days, the pupa being formed in a pure white rather closely netted cocoon that may be spun on the leaves or near the ground or in flower heads. Food plants reported in America are *Trifolium pratense*, *T. medium*, *Medicago sativa*, *Trifolium incarnatum*, *T. repens* and *T. hybridum*. It will also feed on *Medicago lupulina*. Webster (1909) gives a very complete account of the earlier notices of the species in America. Both Webster and Schwarz believe that the occurrence of the species into the Virginia region is due to a new introduction. Webster discusses the possibility of the species having reached the southern coast through the influence of the return ocean currents, floating in on debris. This appears to me improbable; many persons have tried the effect of salt water on insects and found that it is rare for them to survive longer than a few hours, generally scarcely a few minutes, the first wave killing them or so stupefying them that they are soon lost. It is much more probable that this weevil either entered this region by flight, passing a little further southward year by year or was carried there by means of railroad trains.

Houghton reports a spring flight of the species in April in Delaware.

Enemies: Webster has reported the only insects known to feed on the species. From a specimen collected by Mr. Caudell June 12 near Chevy Chase, on June 23, a small fly issued (from a puparium formed in the cocoon of *P. nigrirostris*), which was determined by C. H. T. Townsend as *Anisia* species near *variabilis* Coq.

A larva taken from a clover head 26 June, 1908, "developed into an adult hymenopterous parasite that emerged July 8, 1908". Determined by J. C. Crawford as *Bracon* sp.

The fungus disease (*Entomophthora sphaerosperma* Fres.) attacks this species. For an account of its manner of attack see under *Hyp. punctata*, p. 411.

Phytonomus posticus Gyllenhal.

Curculio haemorrhoidalis:
1784: Herbst: Fues. Archiv. 5: 78, no. 52 (nec. Fabricius 1775).
1794: Herbst: Fues. Archiv. (French ed.) p. 125, no. 37.
1795: Herbst: Nat. Ins. Kafer, 6: 266, no. 235, T. 80, fig. 4.
1818: Germar: Germ. & Zincker Mag. 3: 369.

Rhynchaenus haemarrhoidalis:
1820: Billberg: Enumeratio Insectorum, p. 42.

Curculio variabilis:
1795: Herbst: Nat. Ins. Kafer, 6: 263, no. 232, T. 80, f. 1 (nec. Fabr. 1781).
1807: Illiger: Magaz. f. Insektenkunde, 6:328.

Rhynchaenus variabilis:
1813: Gyllenhal: Insecta Suec. 1 (pt 3): 104, no. 35.
1820: Billberg: Enum. Insectorum, p. 42.
1827: Gyllenhal: Ins. Suec. I (pt. 4, app. 3): 572, no. 35.

Hypera variabilis:
1821: Dejean: Cat. Coll. Coleop., p. 89.
1826: Sturm: Cat. Ins. Sammlung, 1: 157.
1826: Curtis: Brit. Entomology, 2: no. 116. 10.
1829: Curtis: Guide Arr. Brit. Ins. p. 50, no. 18.
1829: Stephens: Sys. Cat. Brit. Ins. p. 169, no. 1731.
1831: Stephens: Entom., 4: 101, no. 25.
1833: Villa: Cat. Coleop. Europ. duplet. in coll.
1844: Villa: Cat. dei Coleop. della Lombardia.
1848: Walton: Ann. Mag. Nat. Hist. (2) 1: 298.
1849: Walton: Stettin. Entom. Zeit., 10: 261.
1853: Murray: Cat. Coleop. Scotland.
1854: Wollaston: Ins. Maderensis, pp. xl., 400.
1861: Waterhouse: Cat. Brit. Coleop., p. 71, no. 11.
1863: Lacordaire: Hist. Nat. Ins. Coleop., 6: 401.
1864: Wollaston: Cat. Coleop. Canaries, p. 328.
1869: Giebel: Verz. z. mus. Univ. Halle-Wittenberg, p. 44, no. 42.
1869: Kraatz: Verz. Kafer Deutsch., p. 52.
1871: Gemminger & Harold: Cat. Coleop., 8: 2388.
1871: Kirsch: Bul. Ent. Zeit., 15: 187.
1873: Bargagli: Bul. Ent. Soc. Ital., 5: 96.
1874: Redtenbacher: Fauna Austriaca. Kafer. 2: 254.
1876: Perris: Larves Coleop., p. 385.
1877: Stein & Weise: Cat. Coleop. Eur., ed. 2, p. 143.
1878: Moesary: Adatok Z. es Lip. Meg. Faunajahoz, p. 240.
1880: Koppen: Die Schadl. Ins. Russland, p. 209, no. 6.
1880: Rupertsberger: Biol. die Kafer Europ., p. 200.
1882: Baudi, Piccioli & Cavanna: Bul. Ent. Soc. Ital., 14: 75.
1882: Piccioli & Cavanna: Bul. Ent. Soc. Ital., 14: 379.
1883: Weise in H. R. & W. Cat. Col. Eur., ed. 4, p. 159.
1884: Bargagli: Bul. Ent. Soc. Ital., 16: 167–8, 173.
1884: Bargagli: Rass. Biol. Rinc. Europei, p. 100.
1887: Wollaston: Cat. Coleop. Mader. in Brit. Mus., pp. 118, 119, 218.
1888: Bedel: Coleop. Bassin de la Seine, pp. 79, 215, no. 15.
1890: Carpentier: Bul. Ent. Soc. Ital., 22: 275.
1891: Fowler: British Coleoptera, 5: 230, 235.
1891: Weise in H. R. & W.: Cat. Coleop., p. 304.
1893: Bertolini: Bul. Ent. Soc. Ital., 25: 245, no. 16.
1894: Hauser: Deutsch. Ent. Zeit., 38: 25.
1894: Rupertsberger: Biol. d. Kafer, 2: 210, 294.
1896: Heyden: Cat. Coleop. Sibiria, p. 152.
1897: Fauvel: Revue Entom., 16: 463, no. 544.
1903: Everts: Coleop. Neerlandica, p. 605.
1907: Wachsmann: Rovar. Lapok, 14:19.

Phytonomus variabilis:
1826: Schönherr: Curc. disposit. meth., pt. 4, p. 175.
1834: Gyllenhal in Schönherr: Gen. et sp. Curc., 2 (pt 2): 384.
1839: Audouin: Ann. des Sc. nat. (2) 11: 107–8.
1839: Falderman: Neue Mem. Soc. Moscou, 6: 189.
1842: Boheman in Schönherr: Gen. et sp. Curc., 6 (pt 2): 380, no. 69.
1844: Germar: Stett. Entom. Zeit., 3: 101.
1847: Hochhuth: Enum. Russelk. Kauk. et Transk., p. 493, no. 105.
1849: Gaubil: Cat. Syn. Coleop. Eur. et Alg., p. 156.
1849: Redtenbacher: Fauna Austriaca, Die Kafer, p. 435.
1849: (Dohrn): Cat. Coleop. Europ., p. 61.
1851: Hochhuth: Bul. Imp. Soc. Mosc., p. 42.
1853: Zebe: Syn. der Bisher Deutsch. aufgef. Coleop., p. 75.
1855: Jac. du Val: Gen. Coleop. Europ., p. 110 (in part).
1857: Lentz: Neus Verz. Preuss. Kafer, p. 124.
1857: Costa: Pergrinazioni sul Monte Alburno, p.
1858: Dohrn: Cat. Col. Europ., p. 79.
1858: Matheiu: Ann. Ent. Soc. Belg., 2: 198, 200.
1858: Redtenbacher: Fauna Austriaca, Die Kafer, ed. 2, p. 729.
1862: Schaum: Cat. Coleop. Europ., ed. 2, p. 89.
1865: Disconzi: Entom. Vicentia, pp. 79, 81, 126, no. 37.
1865: Thomson: Skand. Coleop., 8: 168.
1867: Kanall: Stett. Ent. Zeit., 28: 123 (? species).
1868: Capiomont: Rev. d. Hyperides, p. 205, 284, fig.
1871: Brischke: Schr. nat. Ges. Danzig, n. f. 2: 23.
1871: Kirsch: Berl. Ent. Zeit., p. 1.
1873: Giard: Traite Elem. d' Entom., 1: 671.
1873: Rondani: Bul. Ent. Soc. Ital., 6: 156.
1876: Lafontjn: Tijd. v. Entom., 20: xxi.
1877: Heyden: Jahrb. Nassau. Verein, 29: 312.
1878: Schneider & Leder: Beit. kennt. Kauk. Kaferfauna, p. 287.
1882: Fabre: Nouv. Souv. Entom. vi, pp. 83–88. (Odynerus spinnipes).
1886: Faust: Horae Soc. Ent. Rossicae, p. 86, no. 146.
1888: Bedel: Ann. Soc. Ent. Fr. (2) Coleop. Bas. Seine, p. 260.
1890: ———: Bul. Ent. Soc. Ital., 22: 275.
1891: Faust: Oefers Finsk. Vetensk. Soc., p. 91.
1891: Seidlitz: Fauna Transsylv. p. 676.
1901: Petri: Monog. Coleop.–Tribus Hyperini, p. 181, 203.
1901: Petri: Bestim. Tab. Coleop. Hft. 44, Hyperini, p. 31, 10.
1906: Weise in H. R. & W. Cat. Coleop. Eur., p. 656.
1908: v. Wanka: Entom. Blatter, 4: 230.
1910: Kleine: Entom. Blatter, 6: 198.
1911: Martelli: Boll. Lab. Zool. gen. e agar. R. Scu. sup. Agric. Portic., 5: 226–30.

Curculio bimaculatus:
1802: Marsham: Entom. Brit., 1: 266, no. 86 (nec. Fabricius 1775).

Rhynchænus pollux:
1813: Gyllenhal: Ins. Suecica, 1 (pt. 3): (*nec.* Fabr., *et al.*).

Rhynchænus posticus:
1813: Gyllenhal: Ins. Succ., 1 (pt. 3): 113, no. 41.
1827: Gyllenhal: Ins. Suec., 1 (pt 4, app. 3): 572, no. 41.
1828: Zetterstet: Faun. Ins. Lapp., 1: 320, no. 37.
1834: Sahlberg: Insecta Fennica, pt. 2, p. 44, no. 34.
1840: Zetterstedt: Ins. Lapponica, p. 179, no. 43.

Hypera postica:
1821: Germar: Germ. & Zincker Mag. 4: 340, no. 10.
1826: Curtis: Brit. Entom., 2: no. 116, 13.
1829: Curtis: Guide Arr. Brit. Ins. p. 50, no. 15.
1829: Stephens: Sys. Cat. Brit. Ins. p. 169, no. 1728.
1831: Stephens: Brit. Entom., 4: 100, no. 22.

1869: Giebel: Verz. z. Mus. Univ. Halle-Wittenberg, p. 44, no. 48.
1869: Kraatz: Verz. Kafer Deutsch., p. 52.
1871: Gemminger & Harold: Cat. Coleop., 8: 2386.
1874: Redtenbacher: Fauna Austriaca, Kafer, 2: 253.
1876: Everts & Leesburg: Tijd. v. Ent., 20: xxxi.
1877: Stein & Weise: Cat. Col. Europ., p. 143.
1883: Weise in H. R. & W. Cat. Col. Eur., p. 159.
1884: Bargagli: Bul. Ent. Soc. Ital., 16: 170.
1884: Bargagli: Rass. Biol. Rinc. Europ., p. 97.

Phytonomus posticus:
1833: Dejean: Cat. Coleop. coll. Dejean, p. 264, ed. 2.
1834: Gyllenhal in Schönherr: Gen. et sp. Curc. 2 (pt. 2): 391, no. 34.
1837: Dejean: Cat. Coleop. coll. Dejean, ed. 3, p. 287.
1842: Boheman in Schönherr: Gen. et sp. Curc., 6 (pt. 2): 383, no. 80.
1847: Hochhuth: Enum. Russelkafer Kauk. et Transk., p. 493, no. 103.
1849: Redtenbacher: Fauna Austriaca, Die Kafer, p. 435.
1849: Lucas: Expl. Sc. de Alg. Ins., 2: 246, no. 1132.
1849: (Dohrn): Cat. Coleop. Europ., p. 61.
1853: Zebe: Syn. d. bisher Deutsch. aufgef. Coleop., p. 75.
1855: Jac. du Val.: Gen. Coleop. Europ., p. 110.
1857: Lentz: Neue Verz. Preuss. Kafer, p. 125.
1858: Dohrn: Cat. Coleop. Europ., p. 79.
1858: Matheiu: Ann. Ent. Soc. Belg., 2: 198, no. 203.
1858: Redtenbacher: Fauna Austriaca, Die Kafer, ed. 2, p. 728.
1859: Belke: Bul. Imp. Soc. Mose., p. 53.
1862: Schaum: Cat. Col. Eur., ed. 2, p. 89.
1865: Thomson: Skand. Coleop., 8: p. 172, no. 12.
1873: Bertolini: Bul. Ent. Soc. Ital., 25: 245, no. 16.
1874: Siebke: Enum. Ins. Norvegicum, fasc. 1, p. 265.

Hypera variabilis var. *posticus:*
1891: Weise in H. R. & W.: Cat. Coleop. Eur., p. 304.

Phytonomus variabilis aber. *posticus:*
1906: Weise in H. R. & W.: Cat. Coleop. Eur., p. 656.

Hypera murina var. *variabilis:*
1821: Germar: Germ. & Zinck. Mag., 4: 341, no. 11, var. B. (nec. Fabr.).

Phytonomus murinis var. *variabilis:*
1833: Dejean: Cat. Coleop. coll. Dejean, ed. 2, p. 264.
1837: Dejean: Cat. Coleop. coll. Dejean, ed. 3, p. 286.

Hypera sublineata:
1826: Curtis: Brit. Entom., 2: no. 116. 10.
1829: Curtis: Guide Arr. Brit. Ins., p. 50, no. 12.
1829: Stephens: Sys. Cat. Brit. Ins., p. 168, no. 1718.
1829: Stephens: Entomology, 4: 96, no. 11.

Phytonomus sublineatus:
1842: Schönherr: Gen. et sp. Curc., 6 (pt 2): 384, no. 92 (unrecog.).

Hypera villosula:
1826: Curtis: Brit. Entom., 2: no. 116. 21.
1829: Curtis: Guide Arr. Brit. Insects, p. 50, no. 22.
1829: Stephens: Sys. Cat. Brit. Ins., p. 168, no. 1720.
1831: Stephens: Entomology, 4: 97, no. 14.

Phytonomus villosulus:
1842: Schönherr: Gen. et sp. Surc., 6 (pt. 2): 385, no. 94 (unrecog.)
1858: Dohrn: Cat. Coleop. Europ., p. 79.

Hypera picipes:
1826: Curtis: Brit. Entom., 2: no. 116.3
1829: Curtis: Guide Arr. Brit. Ins., p. 50, no. 1.
1829: Stephens: Syst. Cat. Brit. Ins., p. 168, no. 1721.
1831: Stephens: British Entom., 4: 97, no. 15.

Phytanomus picipes:
1842: Schönherr: Gen. et sp. Curc., 6 (pt. 2): 386, no. 95 (unrecog.).
Hypera variabilis var. *picipes:*
1891: Weise in H. R. & W.: Cat. Coleop. Europ., p. 304.
Hypera phacopa:
1829: Stephens: Sys. Cat. Brit. Ins., p. 169, no. 1729.
1831: Stephens: Entomology, 4: 100, no. 23.
Phytonomus phaeapus:
1842: Schönherr: Gen. et sp. Curc., 6 (pt. 2): 386, no. 97 (unrecog.).
Hypera rufipes: (syn. of Walton, nec. Petri).
1829: Stephens: Syst Cat. Brit. Ins., p. 169, no. 1731. (*nec.* Fabr. *et al*).
1831: Stephens: Entomology, 4: 100.
Phytonomus rufipes:
1842: Schönherr: Gen. et sp. Curco., 6 (pt. 2): 386, no. 98 (unrecog.).
1877: Piccioli: Bul. Ent. Soc. Ital., 9: 228 (?species).
Phytonomus parcus:
1834: Gyllenhal in Schönherr: Gen. et sp. Curc., 6 (pt. 2): 390, no. 33.
1842: Schönherr: Gen. et sp. Curc., 6 (pt. 2): 383.
1855: Jac. du Val: Gen. Coleop. Eur. p. 110.
1858: Dohrn: Cat. Coleop. Eur., p. 79.
1862: Schaum: Cat. Col. Europ., p. 89.
Phytonomus variabilis var. *parcus:*
1868: Capiomont: Rev. d. Hyperides, p. 206.
1901: Petri: Monogr. Coleop. Tribus Hyperini, p. 203.
1901: Petri: Bestim.–Tab. Coleop. Hft. 44, Hyperini, p. 40.
Hypera parca:
1869: Kraatz: Verz. Kaferfauna Deutsch: p. 52.
1869: Giebel: Verz. z. Mus. Univ. Halle-Wittenberg, p. 44, no. 49.
Hypera variabilis var. *parca:*
1877: Stein & Weise: Cat. Coleop. Eur., ed. 2, p. 143.
1883: Weise in H. R. & W. Cat. Coleop., p. 159.
1891: Weise in H. R. & W.: Cat. Coleop., p. 304.
Phytonomus variabilis aber. *parcus:*
1906: Weise in H. R. & W.: Cat. Coleop. Eur., p. 656.
Phytonomus tibialis:
1851: Hochhuth: Bul. Imp. Soc. Mosc., p. 44, no. 42.
1881: Heyden Cat. Coleop. Sibiria, p. 166.
1896: Heyden: Cat. Coleop. Sibiria, p. 152.
Hypera tibialis:
1871: Gemminger & Harold: Cat. Coleop., 8: 2386.
1885: Heyden & Kraatz: Deutsch. Ent. Zeit., p. 282.
1886: Faust: Horae Ent. Soc., p. 146.
Hypera variabilis var. *tibialis:*
1891: Weise in H. R. & W.: Cat. Coleop. Eur., p. 304.
Phytonomus variabilis var. *tibialis:*
1901: Petri: Monogr. Coleop.–Tribus Hyperini, p. 204, p. 182.
1901: Petri: Bestim.–Tab. Coleop. Hft. 44, p. 40.
Phytonomus variabilis aber. *tibialis:*
1906: Weise in H. R. & W.: Cat. Coleop. Eur., ed. 2, p. 656.
Hyperina murina:
1866: Wollaston: Cat. Atlantidum, p. 305 (in part).
Phytonomus variabilis var. *siculus:*
1868: Capiomont: Rev. d. Hyperides, p. 207.
1901: Petri: Monogr. Coleop. Trib. Hyperini, p. 182, 204.
1901: Petri: Bestim.–Tab. Coleop. Hft. 44, Hyperini, p. 40.

Hypera variabilis var. *sicula:*
1871: Gemminger & Harold: Cat. Coleop., 8: 2386.
1877: Stein & Weise: Cat. Col. Eur., ed. 2, p. 143.
1883: Weise in H. R. & W. Cat. Coleop., ed. 4, p. 159.
1891: Weise in H. R. & W.: Cat. Coleop. Eur. p. 304.

Phytonomus variabilis aber. *siculus:*
1906: Weise in H. R. & W.: Cat. Coleop. Europ., p. 656.

Phytonomus variabilis var. *sericeus:*
1868: Capiomont: Rev. d. Hyperides, p. 207.
1901: Petri: Monogr. Coleop. Trib. Hyperini, pp. 182 (sericeas), 203.
1901: Petri: Bestim.-Tab. Coleop. Hft. 44, Hyperini, p. 40.

Hypera variabilis var. *sericea:*
1871: Gemminger and Harold: Cat. Coleop., 8: 2386.
1877: Stein & Weise, Cat. Col. Eur., ed. 2, p. 143.
1883: Weise in H. R. & W., Cat. Col. Eur., ed. 4, p. 159.
1891: Weise in H. R. & W.: Cat. Coleop. Eur., p. 304.

Phytonomus variabilis aber. *sericeus:*
1906: Weise in H. R. & W.: Cat. Coleop Eur., ed. 2, p. 656.

Phytonomus ponticus:
1868: Capiomont: Revis. d. Hyperides, p. 208, no. 46.

Hypera pontica:
1871: Gemminger & Harold: Cat. Coleop., 8: 2386.

Phytonomus variabilis var. *ponticus:*
1901: Petri: Monogr. Coleop. Trib. Hyperini, pp. 183, 203.
1901: Petri: Bestim.-Tab. Coleop. Hft. 44, Hyperini, p. 40.

Phytonomus variabilis var. *austriaca:*
1901: Petri: Monogr. Coleop. Trib. Hyperini, pp. 182, 203.
1901: Petri: Bestim. Tab. Coleop. Hft. 44, Hyperini, p. 40.

Phytonomus variabilis aber. *austriacus:*
1906: Weise in H. R. & W.: Cat. Coleop. Eur. p. 656.

Phytonomus variabilis var. *decoratus:*
1901: Petri: Monogr. Coleop. Trib. Hyperini, pp. 183, 203.
1901: Petri: Monogr.-Tab. Coleop. Hft. 44, Hyperini, p. 40.

Phytonomus murinus:
1907: Titus: Deseret Farmer (Salt Lake, U.) 27 July, p. 7 (no specific name).
1908: Titus: Deseret Farmer, 26 Sep., 3 Oct.
1909: Titus: Journ. Ec. Ent. 2: 148–53.
1909: Titus: Bul. 1, Ext. Dept. Utah Ag. Coll., pp. 4.
1909: Titus: Deseret Farmer: 1 May.
1909: Titus: Utah Independent, 24 June.
1909: Hooker: U. S. D. A. Exp. Sta., Rec., 21: 348.
1909: Bur. Entom. Yearbook f. 1908, U. S. Dept. Agr., p. 569.
1910: Hooker: U. S. D. A. Exp. Sta. Rec., 22: 462.
1910: Ball: Logan Republican (Utah), May.
1910: Blankinship: Salt Lake Tribune, 23 May, figures.
1910: Titus: Bul. 110, Utah Exp. Sta., pp. 17–72, plates 14.
1910: Titus: Journ. Econ. Entom. 3: 459–70.
1911: Webster: Science: n. s., 23: 196–7.
1911: Webster: Journ. Ent. Soc. Wash., 12: 4.
1911: Webster: Cir. 137, Bur. Ent., U. S. Dept. Agr., pp. 9, figs. 10.
1911: Hooker: U. S. D. A. Exp. Sta. Rec. 24: 458.

Original description: Gyllenhal, 1813, p. 113.

"41. *R. posticus: niger, parum cinereo-pubescens, antenis, tibiis, clytrorumque apice ferrugineis, rostro breviusculo, thorace brevi depresso, pectore albido-squamoso.*

"Curculio haemorrhoidalis Herbst, Col. 6. 266. 235, Tab. 80, f. 4.

"Curculio bimaculatus Marsham. Ent. Brit. 1. 266. 86.

"*Habitat in pratorum collibus passim.*

"*Descr. Praecedenti* (*trifolii* which is *praec.* to *plantaginis*) *simillimus, and pro ejus varietate detrita facile habendus, sed paullo major praesertim longior; rostrum brevius, clytrorum apex ferrugineis, et squamulae pectoris non-metallico nitentes. Caput and oculi ut in praecedenti* (*parvum rotundatum nigrum punctulatum, cinereo-pubescens oculis ovatis depressis brunneis*); *rostrum thoracefere brevius, crassiusculum, arcuatum nigrum punctulatum glabrum. Antennæ ut in priori* (*capite cum rostro longiores, crassiuscules ferrugineae, clava cinereo pubescente*). *Thoracis structura etjam ut in illo* (*latitudine multo breviore, basi apiceque truncatus, lateribus valderundato-dilatatus*), *supra depresseus, niger, margine antico supra rufo-picco, confertissime et paullo profundius punctatus, pilis squamulisque cinereis, versus latera densioribus, adspersus. Elytra thoracis basi dimidii latiora, and illo fere quintuplo longiora, apice compressa, subattentuate, supra convexa, nigro-picea apicem versus plus minus rufo-ferruginea, sat profunde* (*p. 114*) *punctato-striata, pilis squamulisque cinereis parcius adspersus. Corpus subtus nigrum, creberrime punctulatum, tenue cinereo-pubescens, ano piceo: pectus pube squamulisque cinereio-albdis, non metallico-nitentibus, tectum. Pedes ut in praecedenti* (*mediocres cinereo-pubescentes*) *femoribus nigro-piceis, tibiis tarsisque ferrugineis.*"

The parts in parentheses I have quoted from the previous species to which he refers in the description.

Adult: (Plate XXXI, figs. 5–8). Length 3–5.1 mm. Width 1–2.4 mm. These measurements are the extreme from over 1000 specimens.

Reddish-black, brown, brownish-black, or black; legs and antennæ always paler; scales cleft about two-thirds of the length, color of pubescence varying from ash-gray to dark brown.

Head with numerous fine punctures, densely covered with pale or gray-brown hairs; *front* never as wide as beak, scarcely as wide as an eye; *eyes* transverse oval, narrower below, slightly prominent; *beak* about two-thirds length of prothorax, narrowed close to eyes, hairy especially beneath and at tip; with a small smooth dorsal keel about one-half the length, followed by a broad smooth triangular dorsal portion that is pointed or nearly so at the tip; a deep narrow longitudinal groove on the base of the wide portion; long narrow punctured striæ on each side beneath the dorsal edge reaching at least three-quarters of the distance to the tip; *antennal groove* deep, narrow, punctured, black; *antennæ* reddish yellow to dark-brown, scape reaching to eyes, shorter than funicle; second joint two-thirds to three-fifths the length of the first; seventh joint as broad as long; club oval, pointed, densely pubescent; mandibles punctured, hairy. Male antennæ inserted near the middle of the groove, female nearer the apex of the beak.

Prothorax usually a little broader than long in female, but in male sometimes scarcely as broad as long, never strongly widened as in *meles*; widest half way between the middle and the anterior edge; sides rounded and swollen, anteriorly strongly rounded, posterior margin wider than anterior; densely roughly finely punctured; dorsum depressed more behind than in front. In perfect specimens the scales form a narrow brown or gray median stripe bordered by wide dark bands, these are bordered by light brown metallic bands which reach down onto the sides, below these again a dark band which extends back onto the humeri, remainder of side and venter pale metallic brown. Pale hairs usually intermixed with scales that form the bands. The entire system of bands or stripes may be obsolete, indistinct or entirely wanting or any one or more of them may be missing, even in specimens recently issued from the pupa.

Scutellum minute triangular, clothed with scales of same color as median thoracic stripe.

Elytra about three times as long as prothorax, almost egg shape, flattened at the base, humeri strongly rounded, convexly prominent, sides sometimes rounded but usually nearly parallel for four-fifths of the length, and then rounded to the tips which are not sharp; finely striately punctured, interstitial spaces very slightly elevated, sometimes the odd-numbered alternate spaces show more strong elevation; scales usually yellowish brown, gray or dark brown but may vary in both direction, hairs black or white or both; even in carefully bred specimens the pattern is extremely variable, passing from those entirely of one color (gray to dark rich brown) to those which are tessellated on almost all the interspaces. In some the sutural interspaces are alternately maculated with pale and dark brown and the alternate interspaces more or less marked in the same manner; usually the scales on the last interspace are paler. A broad common darker sutural basal spot is rather general, this may extend for any distance back on the elytra along the suture, the farther back it reaches the broader it is at the base. Some specimens have the hairs alternating black and white on the interspaces, others black on all and more rarely white on all; they are however very uniformly curved backward lying about one-half down and are long or short, but slender and pointed.

Venter with thoracic portion usually clothed with paler scales, more rarely with intermixed hairs; abdominal portion more hairy, especially in female on last two segments; mesosternal middle coxal process narrow almost linear, parallel sides; intercoxal process of third abdominal segment broad and sloping to a point.

Legs: femora usually darker brown than tibiæ or tarsi, clothed more or less densely in front with scales, behind usually sparsely clothed with hairs, tibiæ and tarsi variable in color with rather long pale hairs; front tibiæ slightly curved inward in male, spines on the inside of the middle tibia vary in length, crown of spines very short and blunt.

Stem of *male gentialia* (Plate XXIV, fig. 10), from above narrow, parallel, sides uniformly thickened, gradually curved on the last third to a narrowly rounded point; viewed from the side last two-thirds

scarcely curved, point sometimes very slightly turned up. The side view (Plate XXIV, fig. 11) is never as in *meles* strongly curved and from the dorsum there can never be seen the peculiar knob-like point possessed by *murinus* (Plate XXIV, fig. 12).

The coloring and pattern of the scales in this species is so variable that it is difficult to describe; and rarely a few specimens have been observed that were as green beneath as *nigrirostris* and as *gray green* above as *comptus* sometimes appears.

Egg: (Plate XXXV, fig. 8). Oval, rounded at ends, lemon-yellow in color when first laid, very slightly roughened, hexagonally sculptured, at one end the depressions are drawn out until they appear as fine striæ. Two to four days after being deposited a dark spot appears at one end as this enlarges the egg becomes paler in other portions, when ready to hatch it is usually shining black where the larval head is beneath the shell and pale yellow or whitish elsewhere. Length 0.55–0.65 mm. Width 0.32–0.38 mm.

Larvæ: (Plate XXXI, figs. 1–2, Plate XXXII, figs. 1,2,9). First stage: 1.4–1.5 mm. long and 0.36 mm. wide. Head shield dark with only a faint trace of the inverted Y, remainder of body pale dirty yellow with black tubercles of segments distinct. Hairs on anal segments longest, all enlarged at tips. Very faint indication of a dorsal stripe.

Second stage: head darker, inverted Y a dirty white, white median dorsal line distinct, remainder of larva green, lighter than plant on which it is feeding. 3.2–4.8 mm. long by 0.7–1.1 mm. wide.

Third stage: entire larva dark ergreen, sometimes the dorsal white line has a rosy red border as in *Hyp. punctata*. A distinct pale stripe is now present on the side of the body below the spiracles; inverted Y on face clear and white. Length 5 to 5.7 mm., width 1.2 to 1.7 mm.

Fourth stage: very little different from the third, larvæ reaches a length of from 7 to 10 mm. and may become as wide as 2.25 mm. The rosy-red of the outer border of the pale median line is much more evident in this stage.

The arrangement of the tubercles is very characteristic. On the first thoracic segment there are three rows (the tubercles are always arranged in pairs on each side of the dorsal line) the first row with 12, the second with 2 and the third with 10. Second segment and all following with at least two rows the anterior of which has but a single pair of tubercles. The posterior on the second segment, 12 tubercles; third segment, 16; fourth and fifth the same; the sixth with 18; seventh with 20; eighth with 16; ninth with 14; tenth with 12, in the posterior, and eight in a middle row; eleventh with 8 in posterior row and 10 in the middle; twelfth with 10 in the posterior row, strongly curved forward in a line. On the sides of the first enlargement below the spiracles are always two hairs situated on tubercles.

Cocoon: (Plate XXXI, figs. 3, 9). varying in size from 4 to 8.5 mm. and occasionly one with one of the axes still longer. Usually oval or globular, depending somewhat on where it is formed. It is composed of pure white threads spun in a rather coarse network, meshes not very regular.

Pupa: (Plate XXXI, fig. 4). Length 4 to 5.5 mm. Width 3 to 4.5 mm.

The newly formed pupa is green and after a few hours pale green, the eyes somewhat darkened at an early stage; the posterior ends of the femora and the anterior ends of the tibiæ are early darkened. Pale dorsal line extending the entire length and onto head but not always the length of the beak. Dorsal rows of transverse setæ enlarged at the tips as in larvæ, hairs on the anal segment rather long and darker than elsewhere on pupa. Prothoracic hairs long, slender, the frontal row not close to the margin, first three pairs in front, fourth on side and fifth far back; central two pairs forming a small square in front of the center, three other pairs in a slight curve near the posterior edge.

Map 10. Distribution over world of *Phytonomus posticus Gyll.*

Distribution: First described by Herbst as *C. haemorrhoidalis* in 1784 from Germany, later by the same author (1795) as *variabilis*, in 1802 by Marsham from England as *C. bimaculatus*. These names were all preoccupied and in 1813 Gyllenhal described it as *R. posticus* from Europe as above noted.

Capiomont and Petri, with other European writers give its distribution as the whole of Europe, southern Siberia, Turkestan, Asia Minor, Persia, Arabia, north coast of Africa, Maderia and Canary Islands and British Isles.

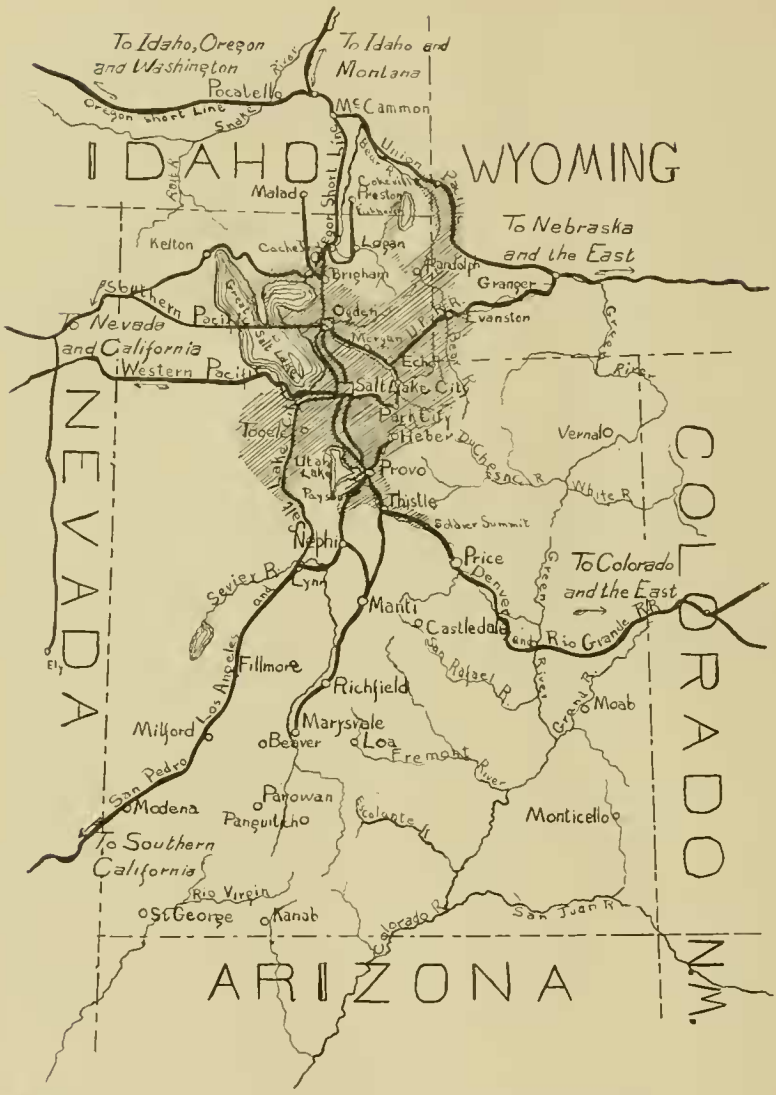
In America it was first reported from Utah, in 1902, and has since been spreading rapidly. Colonies are now known to occur in the adjoining states of Wyoming and Idaho. The accompanying map (map 11) will show the distribution as at present known.

Owing to the extreme variation in size and color there are recorded many synonyms, and doubtless careful working over of the European species will bring to light others. The species has been generally known over Europe as *variabilis*, a name which unfortunately was preoccupied by Fabricius for another insect, also a Phytonomus, in 1781. In the paper in which Herbst described his species he noted that the *variabilis* of Fabricius was merely a variety of *nigrirostris*. This however does not make Herbst's name tenable, the first available name being Gyllenhal's *posticus*.

The species has been reported by most European authors listing Phytonomus.

Life History and *Food Plants:* Little has been written on the life history of this species in Europe, though in late years it has several times been quite injurious. Audouin in describing the collecting habits of *Odynerus spinipes* stated that the larvæ of *variabilis* and *murinus* were living on lucerne (1839). Bargagli in 1884 reported it as seriously injurious in Italy and an editorial in the Bul. Ent. Soc. Ital. 1890, noted that it was a serious pest to clover and alfalfa and briefly describes the egg, larva and cocoon. Koppen (1880) reported serious injury to lucern in Russia. More recently Mr. W. F. Fiske of the Bur. Entomology U. S. Dept. Agriculture told me that the alfalfa regions of southeastern Russia were being seriously damaged by some kind of a weevil, probably a Phytonomus. The present year Dr. Giovanni Martelli has issued a short contribution to the biology of this species. He states that in April 1909, he observed the medicinal plants in a part of the Gussone park at Portici, Italy, being eaten by larvæ. These he bred and they proved to be "*P. variabilis*". He also observed the species causing injury at Acireale in 1910. He reports it causing serious damage in 1909 at Campobasso and at Acicastello in 1910. The present year it is numerous in many parts of Italy.

Kleine (1910) has reported the following food plants in Europe: *Medicago sativa*, *M. falcata*, *M. media*, and *M. lupulina; Astragalus bayonennsis*, *Phaseolus vulgaris*, *Solanum tuberosum*, *Brassica sp.*, *Rubus vitis ideae* and *Plantago lanceolata*, Bargagli reported finding beetles on *Atriplex patula* at Venice. The *Astragalus* record is probably from Perris.



MAP 11. Showing distribution of *Phytonomus postisus* Gyll., in America and the principal railroads leading out of the infected area. (Adapted from Titus, Bul. 110 Utah Agr. Exp. Sta.)

The following account of its introduction into America and its life history is condensed from that given by the author in Bul. 110, Utah Exp. Sta. 1910, with some additional information secured since that paper went to press and from an article in the

Journ. Economic Entomology, Dec. 1910, which gives technical information not in the bulletin mentioned. The earliest record obtainable of its presence in Utah is its occurrence in the spring of 1904 when it was present on a farm on the east side of Salt Lake City. During the years 1905 and 1906 it spread for several miles. I first saw the beetle and larvæ at work early in July 1907 when I went to Utah as Entomologist; it had not then been reported from America. During the next two years it spread rapidly, reaching a number of outlying districts and probably passed over the first range of the Wasatch Mountains into the Weber valley. During 1909 the greatest extension was to the south and southwest. The weevil reached that year a watershed boundary along these lines. On the south at Olivers there is a gap in this boundary through which the Jordan river flows. In Summit county it passed both up and down the stream a number of miles this year. The boundary lines between Davis and Morgan and between Salt Lake and Summit counties are on the summit of the first range of mountains as may be seen by examining the course of the streams. It will be noticed that this range did not hinder the spread of the insect. The same year it passed to the north by the narrow gap of uncultivated land near the lake border north of Salt Lake City and reached a very fertile and prosperous alfalfa region, that of Davis county. During 1910 the distribution was extensive, especially to the southward into Utah County for a number of miles over a country well supplied with food for the insect. At Provo on the south the mountains again come very close to the lake shore but the insect during the summer of 1910 passed this barrier and reached the south side of the lake, being found as far as Payson (Titus, 1910, Ainslie & Titus, 1911). There is no other barrier to hinder its passage for miles. It has passed the barrier of the short canon between Provo and Thistle and will be able to go easily into the valley southward, the Sanpete and Sevier region growing many acres of alfalfa. In August, 1911, Dr. E. D. Ball took a weevil at Soldier Summit, the highest point in Utah on the Rio Grande railroad. In August, 1911, Mr. V. A. Sadler of the Utah Exp. Sta., took weevils above the Dawson Ranch on Bear Creek, east of Heber. To the north all of Davis and Weber counties have been covered and a few have been found at Collinston, Corinne and Honeyville, Box Elder county. There are many acres of alfalfa

throughout the district between Pocatello, Idaho, and Ogden, Utah, including the large and fertile Cache Valley; and to the northwest the lower Bear River and Malad valleys. It has reached the south-west portion of Wyoming at Evanston and Cokeville (H. Smith, 1911), and has been found by Mr. Parks also of the Bureau of Entomology, and by Mr. E. P. Hoff around Bear Lake as far north as Fishhaven, Idaho. There is little food along the Union Pacific railroad for many miles to the east. Westward it has practically reached its limit in the State of Utah, but trains will soon carry it on to the fields of Nevada.

The original Summit and Wasatch county infestations are probably due as much to the moving of camp equipments of the sheep-herders as to any other means. Altitude seems not to affect the weevil and they can probably breed wherever alfalfa can grow, since I have taken larvæ and adults as high as 9,000–9,500 feet in the Wasatch Range. It was probably from this region that they reached Evanston and Lyman, Wyoming.

As with other species of which the life history is known, the beetles are good fliers and distribute themselves readily in this manner. How long these flights may continue is not known, but from the inspection of various districts into which they are moving it is at least possible for them to fly ten to fifteen miles. With this species there are two periods of flight, one in early spring soon after they issue from hibernation, and the other shortly after the adults of the year are appearing in their greatest numbers. The relation of these flights to their life-history may be better understood by consulting the life-history chart in Bul. 110, Utah Exp. Sta. The sense of concealment for protection gives the weevil additional opportunity for distribution since they crawl into any sheltered place. They are often found in fruit packages that are being shipped. Moving of household goods, or in fact any form of freight may give them an opportunity to reach another locality. It is not unusual to find them on the passenger trains going through the infested district and thus they may reach east to the fields of Colorado, Kansas, and Nebraska, and west to Arizona, California, Nevada, Washington and Oregon.

There is practically no danger of distribution in alfalfa seed shipped out of the state, since the weevils even if present, would be screened out in cleaning. At present they do not occur in any region growing seed commercially.

The beetles hibernate in sheltered places of all kinds, roadsides, fences, old orchards, posts, beneath trees in the fallen leaves, in machinery, buildings and haystacks. Some of the adults copulate in the fall. When the first alfalfa begins to grow in the spring the beetles are present and feeding; much is permanently injured by their puncturing the slender stems.

Eggs are laid very early in the year and the egg-laying period is enormously extended. The females mate several times. The males may often be seen sitting on the back of the female and after she has deposited some eggs again mating with her.

The first eggs are laid in or on the leaves, leaf-sheaths, buds or petioles, but later the majority are placed in cavities in the stalks hollowed out by the beak of the female. From one to 28 have been found in a single puncture. The period of incubation is about 10 days.

TABLE I.

Date Laid	Number of Eggs	Days of Incubation										Failed to Hatch
		7	8	9	10	11	12	13	14	15	16	
6 March	5	3	2	..	..	..	..	..	..	..	..	0
8 March	30	..	5	..	9	2	..	..	..	..	..	14
21 March	112	..	9	6	74	8	1	1	1	..	..	12
22 March	86	1	8	32	34	..	1	..	..	..	..	10
30 March	27	..	..	..	2	19	4	..	..	..	..	2
9 April	38	..	1	..	30	5	..	..	..	..	..	2
15 April	7	..	..	..	..	..	..	1	4	..	..	2
16 April	60	..	2	11	28	..	9	..	..	..	..	10
18 April	140	4	7	14	76	27	8	1	..	..	..	3
19 April	19	..	5	5	4	3	..	..	..	..	..	2
23 April	246	..	..	8	86	92	8	4	8	4	4	32
25 April	138	..	..	15	82	22	10	..	..	..	..	9
10 May	56	..	..	..	20	20	..	..	..	..	..	16
20 May	27	..	..	14	9	..	..	..	..	..	..	4
25 May	33	..	7	5	..	..	..	..	..	..	..	11
31 May	46	..	9	9	22	2	..	..	..	..	..	4
10 June	50	..	..	28	20	..	..	2	..	..	..	0
15 June	16	..	..	9	4	..	..	..	1	..	..	2
24 June	13	..	..	..	..	..	..	4	1	..	..	8
	1139	8	55	156	500	200	41	13	15	4	4	143

Average hatching period = 10.22+ days.

The young larvæ often feed in the stems for a considerable time, (Plate XXXII, fig. 9), some even passing the second molt there. Later they crawl out and up the stem, concealing themselves in the growing leaf-buds where they feed extensively and effectually stop the growth of the plant. When nearly full grown many feed entirely unprotected on the leaves. At this time the plants in a severely infested region become practically defoliated. The larvæ have the characteristic curled position when feeding and like others of this genus drop to the ground when disturbed.

The first stage is passed in five to eight days; the second in twelve to twenty, third in twelve to twenty-five, and the fourth in one to twelve days.

When full grown they go to or near to the ground and spin their cocoon in a curled leaf or among the debris on the ground. Some even go to other plants nearby and spin up. From 24 to 48 hours after making the cocoon they change to the pupal stage and remain in this for six to fourteen days before emerging as adults. The adult beetle usually spends one or more days in the cocoon before cutting its way out. The cocoon is not usually eaten, only a large enough place to allow the adult to escape being made. The length of life of the adult varies from ten to fourteen months, and some may live over until the second year. I had one female from a lot of eggs hatched in May, 1909, that lived until May 11, 1911. She was mated with one of the same lot, with a son and with a grandson (bred in captivity the winter of 1910–11) and each time laid eggs which were fertile. She laid at least 312 eggs.

The greatest period of emergence is three to four weeks after the first beetles appear from the eggs laid that year. After July or August the weevils feed but little, but up to that time they cause considerable damage by gnawing the parenchyma of the alfalfa and clover stalks.

We have bred the weevil from the following food-plants: *Medicago sativa*, *M. lupulina*, *Melilotus alba*, *M. officinalis*, *Trifolium pratense*, *T. repens*, *T. hybridium*, and *T. incarnatum*. I have several times found them hibernating under leaves of *Astragalus utahensis*. Injuries to wheat and potatoes have been reported but I have not observed them. I have, however, repeatedly seen the adults feeding on ripe strawberries.

Enemies: The enemies in America are very scarce and do little to aid in checking the insect. Several undetermined Carabids feed upon the weevil, its pupa and larva; three Heteroptera, *Acanthorocis musculus*, *Reduviolus roseipennis* Reut. (Det. Otto Heidemann), and *Miris affinis* have been seen eating the eggs, while several species of ants, including *Pogonomyrmex occidentalis* Cress. (Det. W. M. Wheeler), capture the larvæ when crawling on the ground and more rarely ascend the plants for them. Several spiders that frequent alfalfa fields occasionally capture larvæ. Frogs, toads, horned toads, lizards and swifts all do a small part each toward the control. Blackbirds and the western grosbeak often eat them. Even the English sparrow will get one once in a while and very rarely a few are fed to its young. Chickens and turkeys readily feed on them, but soon become satiated and will eat no more until the next day. A vole killed in an alfalfa field where they were very numerous had one beetle in its stomach.

At the present time the Bureau of Entomology is endeavoring to introduce egg-parasites (Mymarids) from Italy, and other parasitic enemies from Europe.

In Europe, Audouin, Girard, Fabre and others have reported the capture of the larvæ of this and another species (*Phytonomus murinus* Fab.) by a wasp, *Odynerus spinipes*. The wasp stings the larvæ and then stores them in its burrows for the feeding of its young. One of the most fascinating of Fabre's papers is upon the life-history and habits of this wasp. Bertolini reports that Carpentier cites a Pteromalus as feeding on this species. A species of Canidia is also reported as parasitic.

Dr. L. O. Howard of the Bureau of Entomology at Washington very kindly sent me a translation of a paper by Dr. G. Martelli of the Experiment Station at Portici, Italy. In it is recorded *Canidia curculionis* Thoms. This species hibernates in its cocoon in the cocoon of the weevil, emerges in February, and deposits its eggs in the small larvæ of the Phytonomus. The weevil larvæ attain maturity and spin their cocoon, the mature parasite then feeds on the internal organs, kills the larvæ and later issues from the skin and spins its own cocoon. This is at first white, but in a day or so becomes dark red and later develops a testaceous brown color with a white band. Its length is 2 to 2.5 mm., and its width over 1 mm. Martelli had adults issue 24 April from parasites born 24 March. He states

that the larva matures in 11 to 13 days, the pupa in 2 days and the adult issues from 14 to 16 days later. This gives 27 to 31 days from the egg to adult. There are two generations each year, the second hibernating.

He also records a species of *Eulophus* the adults of which appear about the middle to the end of May. The eggs, from one to six in number, are deposited on the outside of the body of the Phytonomus larva. This parasite may also be hyperparasitic on *Canidia*.

A third parasite recorded is *Pimpla maculator* F., the life-history of which is unknown.

Three hyperparasites are recorded: a *Habrocytus*, a *Chalcid* and *Dibrachis boucheanus*, all living upon the *Canidia*.

Disease: Attempts were made in 1910 by the agents of the Bureau of Entomology to introduce *Entomophthora sphaerosperma* into Utah. It is not yet certain that these were successful and even if introduced it is extermely improbable that the disease will be of any particular value in the arid regions of the West.

INDEX TO SPECIES AND SYNONYMS.

INDEX TO PLANTS.

EXPLANATION OF PLATES.

PLATE XXIV.

1. Maxilla *P. comptus.*
2. Labial palpus. *comptus.*
3. Mandible *comptus.*
4. Mandible of *P. posticus.*

Stem (forceps) of genitalia (dorsal view except 5 and 11).

5. *P. comptus* (side view, New Jersey specimen).
6. *P. comptus.*
7. *P. eximius* (Nebraska specimen).
8. *P. quadricollis* (Aweme specimen).
9. *P. meles* (Connecticut specimen).
10. *P. posticus.*
11. *P. posticus* (side view).
12. *P. murinus* (European specimen).
13. *P. rumicis* (European specimen).
14. *Hypera punctata.*
15. Mandible, *P. meles.*
16. Maxilla, *P. meles.*
17. Antenna, *P. comptus.*
18. Emarginate hair.
19. Emarginate scale.
20. Deeply emarginate scale.
21. Deeply cleft scale.
22. Cleft scale.

Larval segments (dorsal outlines).

23. *P. meles* (redrawn from Laboulbene).
24. 4th segment, *H. punctatus.*
25. 4th segment, *P. posticus.*
26. 4th segment, *P. nigrirostris.*
27. 8th segment, *P. posticus.*
28. 8th segment, *P. nigrirostris.*
29. 1st thoracic, *H. punctata.*
30. 1st thoracic, *P. posticus.*
31. 1st thoracic, *P. nigrirostris.*
32. 8th segment, *H. punctata.*

PLATE XXV.

Hypera punctata Fab.

1. adult dorsal.
2. adult ventral.

(Enlarged 10x).

PLATE XXVI.

Hypera punctata Fab.

1. full-grown larva.
2. cocoon.
3. pupa, ventral.
4. adult, face.
5. pupa, side.

(Enlarged 10x).

PLATE XXVII.

Phytonomus diversipunctatus Schrank.

1. adult side (Greenland spec.)
2. adult face (Greenland spec.)

Phytonomus quadricollis Lec. (type M. C. Z.)

3. adult dorsal.
4. adult side.
5. adult face.

Phytonomus eximius Lec. (type M. C. Z.)

6. adult dorsal.
7. adult side.
8. adult face.

(Enlarged 10x).

PLATE XXVIII.

Phytonomus comptus Say.

1. adult dorsal tessellated form.
2. adult dorsal red form.
3. adult side red form.
4. adult face tessellated form.
5. cocoon (Illinois).
6. pupa (alcoholic specimen).
7. larva (alcoholic, New Jersey).

(Enlarged 10x).

PLATE XXIX.

Phytonomus trivittatus Say.

1. adult dorsal (type of setigerus Lec. M. C. Z.).
2. adult face (type of setigerus).
3. adult side (type of setigerus).
4. adult dorsal (Aweme specimen).
5. adult side (Kansas specimen).

Phytonomus seriatus Mann.

6. adult face.
7. adult dorsal.

Phytonomus maritimus Titus.

8. adult face.
9. adult dorsal.

Phytonomus pubicollis Lec. (type M. C. Z.).

10. adult, dorsal.
11. adult face.
12. adult side.

(All enlarged 10x).

PLATE XXX.

Phytonomus nigrirostris Fab.

1. adult dorsal.
2. pupa (alcoholic).
3. cocoon.

Phytonomus meles Fab.

4. adult dorsal, gray form.
5. adult dorsal, striped form.
9. adult face, striped form.

Phytonomus castor Lec.

7. adult dorsal, type (M. C. Z.).
8. adult side, type (M. C. Z.).
6. adult face, Aweme specimen.

(All enlarged 10x).

PLATE XXXI.

Phytonomus posticus Gyll.

1–2. larvae.
3. cocoon.
4. pupa.
5–6. large and small adults.
7. adult, face.
8. adult, ventral.
9. cocoons (various forms, 2x).

(All but fig. 9 enlarged 10x).

PLATE XXXII.

Phytonomus posticus Gyll.

1. larvae in characteristic feeding position.
2. larvae showing typical curling habit.
3. leaf showing injury.
4. adult injury to stem.
5–7. adult feeding punctures.
8. stem split open showing eggs.
9. young larva coming out of stem.

(Figs. 1–7 adapted from Titus: Bul. 110, Utah Agr. Exp. Sta.)

PLATE XXXIII.

Phytonomus posticus, Gyll.

1. Barton gathering machine at work.
2. Hemenway gathering machine.
3. Weevil larvae captured from three acres by Barton machine.

(From Titus, Bul. 110, Utah Agr. Exp. Sta.)

PLATE XXXIV.

Phytonomus posticus Gyll.

1. Second crop alfalfa on ground harrowed and brush-dragged (Fox place).
2. Second crop alfalfa on untreated ground same date.
3. Typical hibernation quarters on border of field.